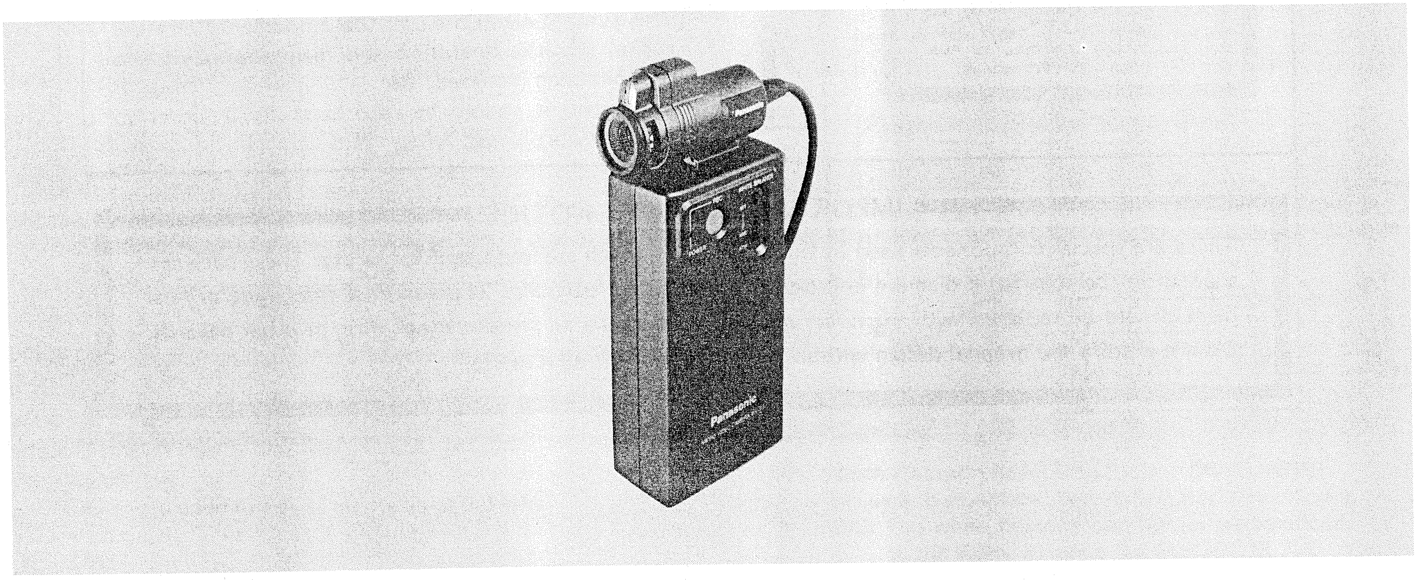
ORDER NO. AVS9010384C8

Service Manual

Micro Video Camera

WV-F5E



SPECIFICATIONS

Power Source:	12V DC (To be supplied by NV-FV1 series)
Power Consumption:	3.2W
Pick-up Device:	512(H) X 582(V).pixels, Interline Transfer 1/2"CCD
Horizontal Resolution:	310 lines at centre
Minimum Illumination:	15 Lux
Recommended Illumination:	200 Lux
External Mic Input:	−72dB High Impedance
Lens:	ALC Lens (F1.6, f=7.5mm)
White Balance:	Selectable ATW (Auto Tracing White Balance) or AWC (Auto White Balance setting)
Operating temperature:	0°C - 40°C
Operating Humidity:	35% - 80%
Weight: (Camera head and camera control unit)	400g
Dimensions:	Camera head; 43(H) x 30(W) x 98(D)mm Camera control; 134.5(H) x 40(W) x 70(D)mm

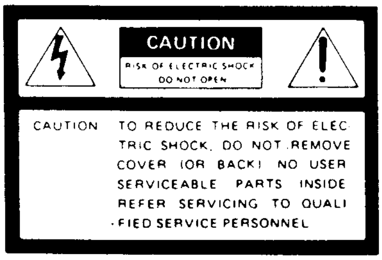
STANDARD ACCESSORY

Camera Connection Cable [Part No.: YWF05018]	1 pc.

OPTIONAL ACCESSORY

Accessory Kit	WV-KT5E
Extension Cable	WV-CA5E

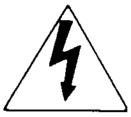
Panasonic



CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION TO REDUCE THE RISK OF ELECTRIC SHOCK. DO NOT REMOVE COVER (OR BACK) NO USER SERVICEABLE PARTS INSIDE REFER SERVICING TO QUALIFIED SERVICE PERSONNEL



This symbol warns the user that uninsulated voltage within the unit may have suificient magnitude to cause electric shock. Therefore, it is dangerous to make any kind of contact with any inside part of this unit.

This symbol alerts the user that important literature concerning the operation and maintenance of this unit has been included.
Therefore, it should be read carefully in order to avoid any problems.

IMPORTANT SAFETY NOTICE

There are special components used in this equipment which are important for safety. These parts are shaded on the schematic diagram and on the replacement parts list. It is essential that these critical parts should be replaced with manufacturer's specified parts to prevent shock, fire, or other hazards. Do not modify the original design without permission of manufacturer.

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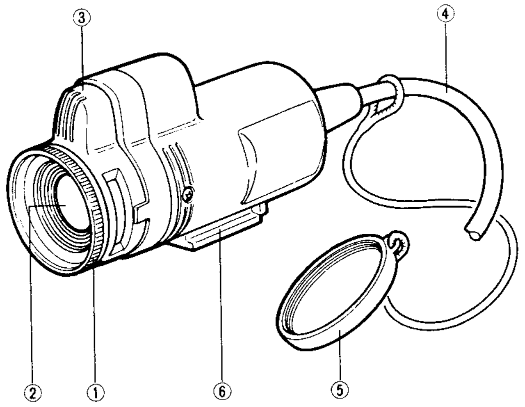
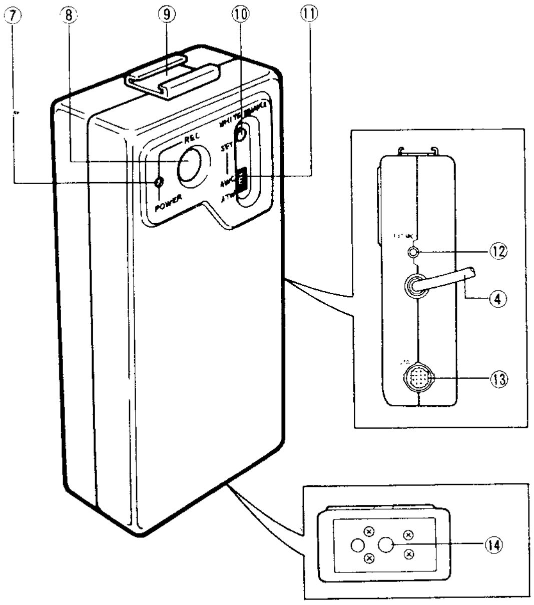
MAJOR OPERATING CONTROLS AND THEIR FUNCTIONS

CAMERA HEAD



CAMERA CONTROL UNIT



1. **Focus ring**
   This ring is used to adjust the focus of the lens.

2. **Lens**

3. **Internal Microphone**

4. **Camera Cord**

5. **Lens Cap**

6. **Camera Mounting Angle**
   This is used to mount the camera head on the camera control unit.

7. **Power/Recording Indicator (POWER/REC)**
   - When turning on the power of the portable TV with VTR, this LED will light on.
     When this camera is in the stand-by mode by pressing the Stand-by Button of the portable TV with VTR, this lamp will light off.
     Press the Stand-by Button again to release the stand-by mode and the LED will light.
   - When this camera is in the recording mode this LED changes to "red" from "green".

8. **Recording Button (REC)**
   To start the recording mode, press this button.

9. **Accessory Shoe**

10. **White Balance Set Button (SET)**
    In case the White Balance Selection Switch (11) is turned to the AWC position, the white balance can be set by pressing this button while aiming the camera at the white object.
    The white balance setting is required whenever the lighting condition is changed.

11. **White Balance Selection Switch (AWC/ATW)**
    This switch selects white balance mode as follows;
    AWC: The white balance can be set automatically by the White Balance Set Button (10).
    ATW: The white balance is automatically set by detecting the characteristic/colour temperature of light source even if the characteristic/colour temperature changes during the shooting.

    Note:
    1. It is recommended to use the ATW position if quick setting up is required or the characteristic/colour temperature of light would vary during the shooting.
    2. It is recommended to use the AWC position if the characteristic /colour temperature of scene does not vary.

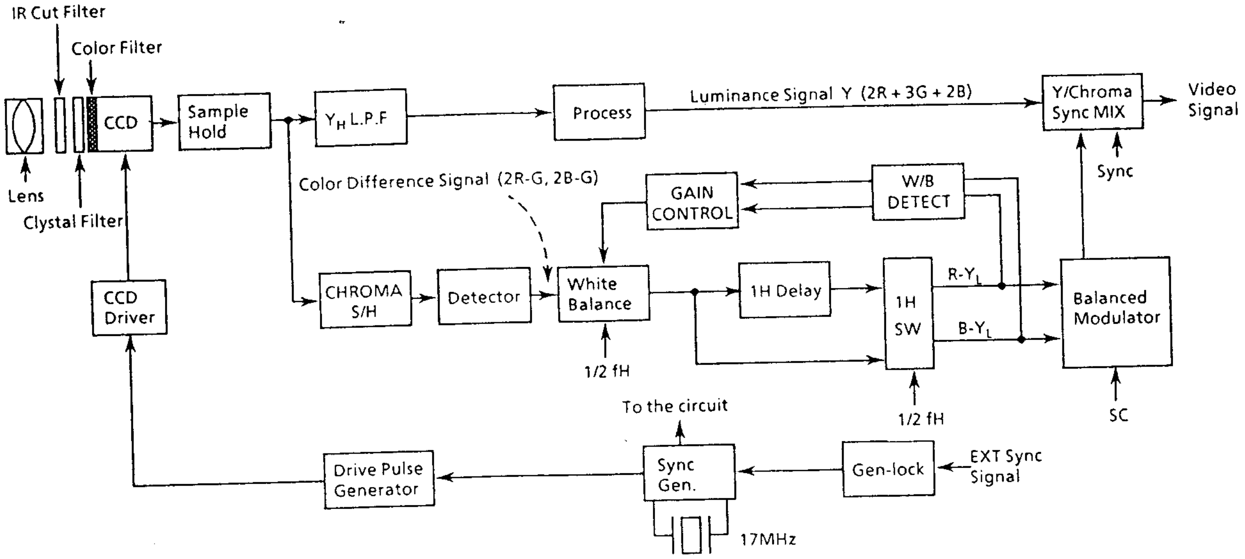
12. **External Microphone Input Connector (EXT MIC)**
    This connector is used to connect the external microphone.

13. **Portable TV with VTR Connector (VTR)**
    This connector allows to connect this unit with the optional portable TV with VTR.

14. **Tripod Mounting Holes**

CIRCUIT DESCRIPTION

1. Principle of Color CCD Camera



IR Cut Filter
Color Filter
CCD
Lens
Clystal Filter
Sample Hold
Y_H L.P.F
Process
Luminance Signal Y (2R + 3G + 2B)
Y/Chroma Sync MIX
Video Signal
Sync
Color Difference Signal (2R-G, 2B-G)
GAIN CONTROL
W/B DETECT
CCD Driver
CHROMA S/H
Detector
White Balance
1H Delay
1H SW
$R-Y_L$
$B-Y_L$
Balanced Modulator
1/2 fH
To the circuit
1/2 fH
SC
Drive Pulse Generator
Sync Gen.
Gen-lock
EXT Sync Signal
17MHz

Fig. 1-1 Block Diagram of WV-F5

The incoming light passes through the lens, the infrared (IR) cut filter, and the crystal filter to reach the surface of the CCD (charge coupled device) image sensor. The CCD image sensor produces the output signal whose level corresponds to incoming light intensity. The output signal is converted into prevideo signal by sample hold circuit. This signal is routed in two different ways through the Y_H low pass filter (Y_H L.P.F), and the chroma sample hold respectively. The luminance signal flows through the Y_H L.P.F to the process circuit, to be mixed with tne color signal and sync signal, and output from the camera. The chroma sample hold passes only the modulated color difference signal. This signal is passed to the detector which develops the color difference signals (2R-G & 2B-G), which correspond to R-Y & B-Y.

These signals are sent in serial form (2R-G/2B-G/2R-G/2B-G etc.) to the white balance circuit for level matching.

The sequential 2R-G 2B-G signal is then split and sent through a delay line, and directly, to a switch, which is switched at one-half of the horizontal rate. This routing converts the sequential signal into two parallel color difference signals.

The color difference signals are then modulated by 4.43MHz subcarrier in balanced modulator, and mixed with the luminance signal for yielding the composite PAL output signal.

The sync generator generates necessary pulses for producing the composite color video signal, and send them to the CCD drive pulse generator circuit and signal processing circuit.

The CCD drive pulse generator generates H. and V. transfer pulse which are synchronized with the H. and V. drive pulses and sends them to the CCD image sensor through CCD drive circuit for driving sensor

- **Infrared Cut Filter**

As shown in Fig. 1-2 the CCD image sensor has sensitivity in infrared region beyond the visible range.

If the signal is made by using the infrared rays which the human eye can not normally see, picture on the monitor and that seen with the naked eye would differ substantially.

The infrared (IR) cut filter blocks the infrared light rays which the human eye does not see as light.

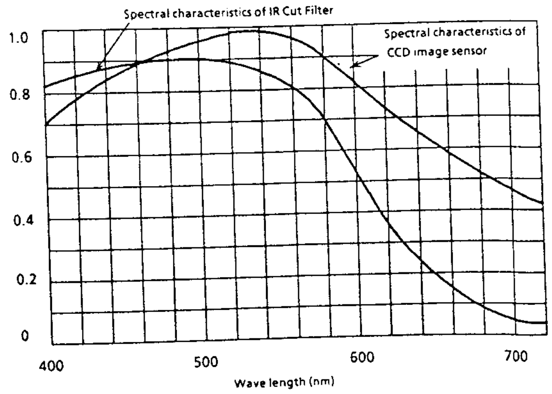


Fig. 1-2 IR Cut Filter Response

- **Crystal Filter**

The yellow, cyan, green and magenta images are modulated by the fine mosaic filter built into the CCD image sensor, a false signal could develop due to interference between the fine mosaic filters and fine detail objects. The crystal filter is an optical low pass filter which prevents the occurrence of such false signals by blocking the high frequency components of images.

- **CCD Image Sensor**

CCD image sensor is made up of a simple MOS structure and consists of;

(1) Photo diode (PD) ---	Generates charge packets corresponding to the incoming light intensity.
(2) V-CCD ----------------	Accumulates the charge packets from PD and transfers them in the vertical direction.
(3) H-CCD ----------------	Transfers charge packets in the horizontal direction to the output.
(4) Output Section -----	Outputs the signal transferred from the H-CCD sequentially.

The block diagram of the CCD image sensor is shownin Fig. 1-3.
Each pixel corresponds to one photo diode.

- **Interline Transfer System**

Accumulated charge packets on the independent sensor (Photo Diode) are transferred to the vertical shift register (V-CCD) all at once in every vertical blanking period (1/50 sec). They are then shifted one-step down to the horizontal shift register (H-CCD) in every horizontal blanking period. The charge packets in H-CCD are transferred to the left by turns, and taken out as the output signal.
Transferring the charge packets down in the V-CCD corresponds to vertical deflection and transferring the signal charges from the V-CCD to the left, in H-CCD corresponds to horizontal deflection.

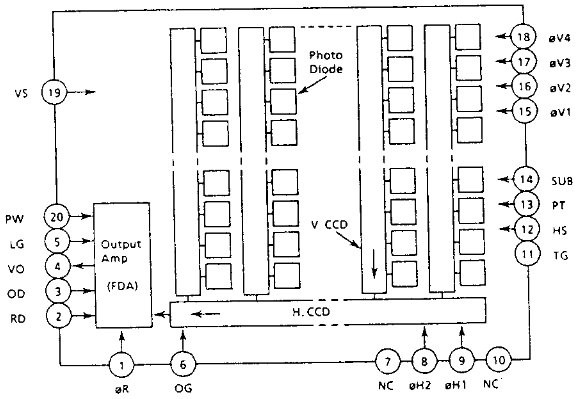


Fig. 1-3 Block Diagram of CCD Image Sensor

In the next section, the transfer is described in sequence.
Let's study it by referring to the timing of the composite video output (VBS) signal.

① At first, all accumulated charge packets in all photo diodes are read out into the V-CCD ((1), (2)).

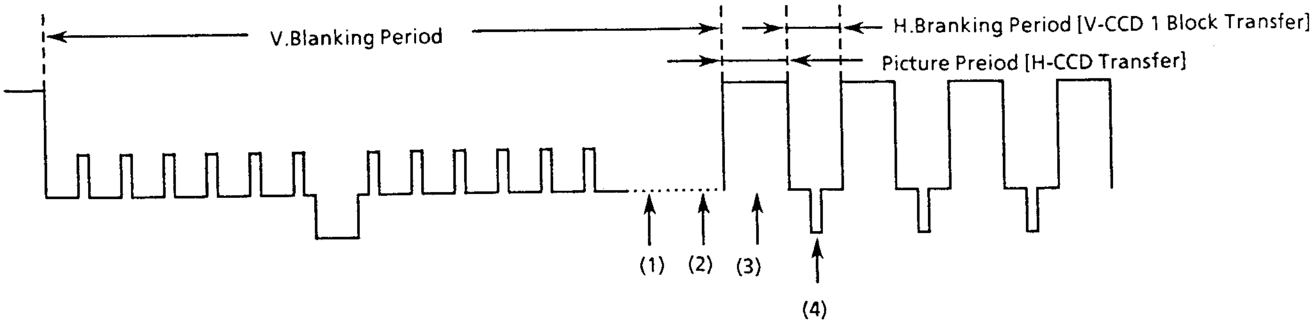
② The charge packets in the V-CCD are transferred one-step down. By this action, the charge packets of one horizontal line are transferred to the H-CCD ((4)).

③ The charge packets in the H-CCD are transferred to the left in order and the video signal for that line is output during the horizontal scanning period (horizontal picture period) ((3)).

④ After completing the transfer from right to left, the next row of charge packets in the V-CCD are transferred into the H-CCD in the next horizontal blanking period.

⑤ By repeating ② ~ ④, charge packets for 1V period (312.5lines) have been transferred (No. 1 field has been completed.).
After that, the steps beginning at ① are repeated for the No. 2 field scanning.

As a result, the readout of the charge packets from the PDs is done every 1V period (1/50 sec.). A by-product of this system is a flicker effect when fast moving objects are scanned.



V.Blanking Period
H.Branking Period [V-CCD 1 Block Transfer]
Picture Preiod [H-CCD Transfer]
(1)
(2)
(3)
(4)

Fig. 1-4 Timing Chart of Transfer

The sensor incorporates an integrated color filter, much the same as a tube-type camera.

The CCD image sensor contains an array of photo-diodes (PD), each under it's own colored filter. As shown below, the photo-diodes are connected to vertical shift registers (V-CCD), which are connected to a horizontal shift register (H-CCD). The output is taken from the Floating Diffusion Amplifier (FDA).

Figure 1-5 indicates the signal charge readout system. This system is called the "field integration" mode, whereby the outputs of a pair of PDs are mixed to produce a single charge packet.

First, each PD charges to a level which is dependent on the level of incident illumination. These charges are then shifted to the VCCD by vertical transfer pulses 1 and 3 (øV1 & øV3). Next, pairs of charges are mixed to produce charge packets. Different pairs of charges are mixed for fields A and B.

a) Charge storage in the photo-diodes
b) Charge transfer from PDs to V-CCD
c) Mixing of charges in V-CCD for field A
d) Mixing of charges in V-CCD for field B

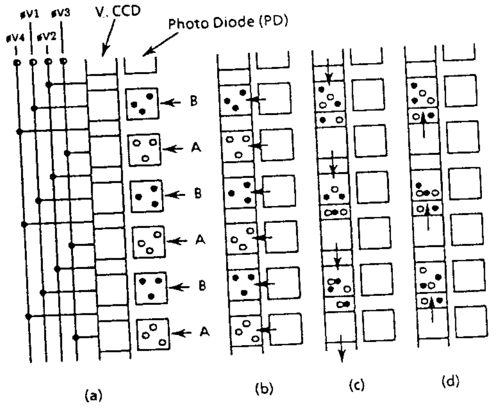

øV1 øV3
øV4 øV2
V. CCD
Photo Diode (PD)
B
A
B
A
B
A
(a)
(b)
(c)
(d)

Fig. 1-5 Readout Organization of Signal Charge

Figure 1-6 shows the layout of the color filter. The mixing scheme is shown for both fields as well. For example, to produce line 1 of field A, rows 1 & 2 are mixed. Line 2 is produced by mixing rows 3 & 4, and so on. To produce the first line of field B however, rows 2 & 3 are mixed, followed by 4 & 5 for the next line, and so on.

The output signals from the CCD image sensor are as follows;

Complete signal, line N

$$S_N = Y_N + C_N \sin(\omega c.t)$$

Complete signal, line N + 1

$$S_{N+1} = Y_{N+1} + C_{N+1} \sin(\omega c.t)$$

Luminance component, line N

$$Y_N = (Ye + G) + (Cy + Mg) = 2R + 3G + 2B$$

Luminance component, line N + 1

$$Y_{N+1} = (Ye + Mg) + (Cy + G) = 2R + 3G + 2B$$

Chrominance component, line N

$$C_N = (Cy + Mg)\text{-}(Ye + G) = 2B\text{-}G$$

Chrominance component, line N + 1

$$C_{N+1} = (Ye + Mg)\text{-}(Cy + G) = 2R - G$$

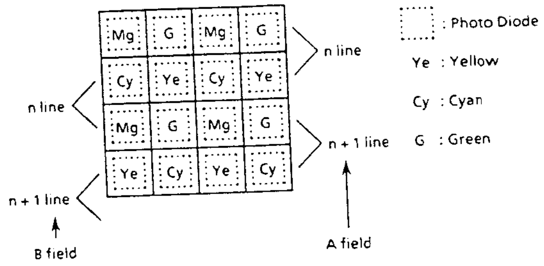

Mg
G
Mg
G
Cy
Ye
Cy
Ye
Mg
G
Mg
G
Ye
Cy
Ye
Cy
n line
n line
n + 1 line
n + 1 line
B field
A field
: Photo Diode
Ye : Yellow
Cy : Cyan
G : Green

Fig. 1-6 Color Filter Geometry

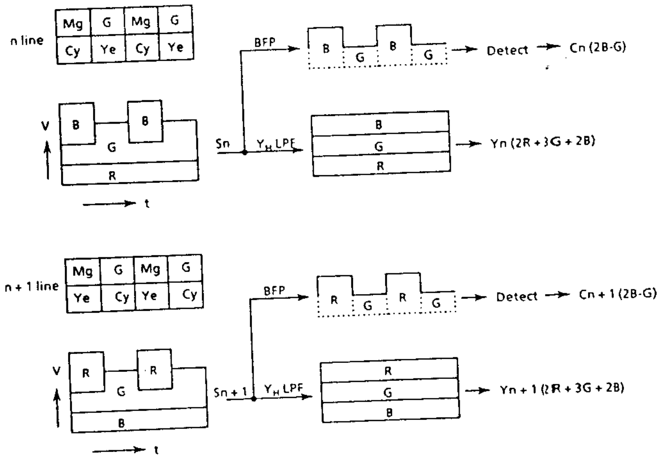

n line
Mg
G
Mg
G
Cy
Ye
Cy
Ye
BFP
B
G
B
G
Detect
Cn (2B-G)
V
B
B
G
R
t
Sn
Y_H LPF
B
G
R
Yn (2R + 3G + 2B)
n + 1 line
Mg
G
Mg
G
Ye
Cy
Ye
Cy
BFP
R
G
R
G
Detect
Cn + 1 (2B-G)
V
R
R
G
B
t
Sn + 1
Y_H LPF
R
G
B
Yn + 1 (2R + 3G + 2B)

Fig. 1-7 Color Signal Separation (Field "A")

2. Sensor Board

This board receives CCD drive pulses and feeds them to the CCD image sensor IC1 in order to take out the CCD output signal. The CCD output signal obtained at pin 4 of IC1 is passed through buffer Q2 on the ALC board to sample hold circuit in Drive board.
The horizontal transfer pulses øH1, 2 and øH3, 4 from Drive board are fed to pins 9 and 8 of IC1 respectively.
The vertical transfer pulses øV1, øV2; øV3 and øV4 from Drive board and ALC board are fed to pins 15, 16, 17 and 18 of IC1 respectively.
The reset pulse (øR) from Drive board is fed to pin1 of IC1.

CCD Image Sensor
The CCD image sensor used in the single-chip camera has a color separating system using the field integration operation mode which has superior characteristics, such as no field time lag and less false signal.
A color filter array consisting of four colors, yellow, cyan, green and magenta gives a large luminance signal and a deep modulated color signal by adopting a line sequential color differential method.

The CCD image sensor MN3745NC has 297.984 picture elements (vertical (V) 582 x horizontal (H) 512). Its image size is 4.89(V) x 6.53(H)mm^2 so that a 1/2-inch optics and lens can be used.
The CCD image sensor is mounted on dual in line package with 20 pins and has a optical window in front of the cell as shown in Fig. 2-1.

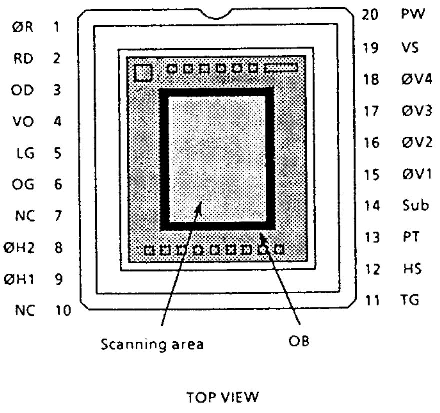


Fig. 2-1 Appearance of CCD Image Sensor

Items	Value	Unit
Chip Size	6.35(V) × 7.85(H)	mm^2
Cell Size	8.41(V) × 12.76(H)	μm^2
Image Size	4.89(V) × 6.53(H)	mm^2
Number of elements	582(V) × 512(H) (Excluding O.B)	pcs

Table 1 Specification of CCD Image Sensor MN3745NC

The pin identification of CCD image sensor MN3745NC is as follows;

Pin No.	Pin Name	Description
1	øR	Reset Pulse
2	RD	Reset Drain
3	OD	Output Drain
4	VO	Video Output
5	LG	Gate of Output Load Transistor
6	OG	Output Gate
7	----	Not Used
8	øH3, 4	H Transfer Pulse 2
9	øH1, 2	H Transfer Pulse 1
10	----	Not Used
11	TG	Test Terminal
12	HS	H CCD Input Source
13	PT	Protection for P-Well
14	Sub	Substrate
15	øV1	V Transfer Pulse 1
16	øV2	V Transfer Pulse 2
17	øV3	V Transfer Pulse 3
18	øV4	V Transfer Pulse 4
19	VS	V.CCD Input Source
20	PW	P-Well

3 Mic Board

There is the Mic Amplifier Circuit consisting of IC1 and Q2 is on this board.

The audio signal picked up by the internal microphone whose level is approx. -70dB is amplified 26dB by IC2 (a) (pins 1, 2 and 3) and 20 dB by IC2 (b) (pins 5, 6 and 7). The amplified audio signal obtained at pin 7 of IC2 is sent to the Power Board in the Camera Control Unit (CCU) through buffer Q1, pin 6 of E3/CN2 on Drive board and pin 8 of camera cable.

4 ALC Board

This board contains the ALC Drive circuit consisting of IC3 and IC4. The ALC control DC signal from the CCU through pin 8 of E1 is fed to pin 6 of IC3 (b). The VR1 (ALC LEVEL) sets the iris opening at the standard lighting contains. The ALC drive output obtained at pin 7 of IC3 (b) is fed to the Drive coil in the lens through pin 2 of CN2 and pin 3 of CN1. In order to prevent the iris hunting, the dumper signal generated by the Damper Coil in the lens is fed to pin 3 of IC3 (a) through pin 2 of CN1 and pin 1 of CN2. The damper output obtained at pin 1 of IC3 (a) is supplied to pin 6 of IC3 (b) through R50 and R24.

5. Drive Board

This board contains the Damper Limitter circuit consisting of Q10.

6. Process Board

This board contains following circuit.

6-1 Sample Hold Circuit
6-2 Y/C Process Circuit
6-3 Y/C Encoder Circuit
6-4 Sync Generator Circuit
6-5 Drive Pulse Generator Circuit

6-1 Sample Hold Circuit

This circuit receives the modulated CCD output signal from the CCD image sensor IC1 on the Sensor board and eliminates reset pulse and noise, and produces a prevideo signal.

The CCD output signal obtained at pin 8 of CN1 is supplied to pin 2 of sample hold IC4. The signal level of modulated CCD output signal is fed to limiter circuit in IC4 for eliminating large transfer noise. This signal is fed to clamp circuit where it is clamped to specified DC level by ø1 pulse supplied to pin 10 of IC4. The clamped signal is then sent to sample hold circuit where the signal components with noise components are sampled by the sample pulse ø2 sent through pin 9 of IC4.

The other hand, limited signal is directly sent to other sample hold circuit to detects the noise component. The both sample hold signals are fed to a differential amplifier to eliminate the noise component and prevideo signal is detected. This signal obtained at pin 12 of IC4 is supplied through buffer Q10 to Y/C Process circuit

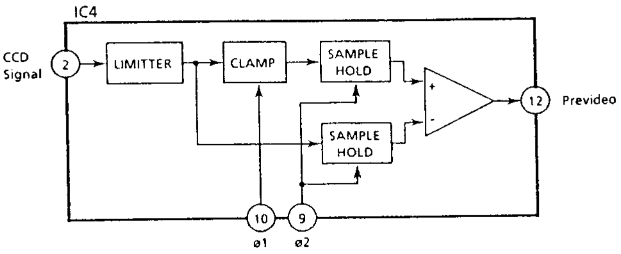


Fig.6-1

6-2 Y/C Process Circuit

This circuit consisting of IC5, IC8, Q11-Q19, Q28-132 separates Y (Luminance) and C (Chrominance) signal from the prevideo signal, maintain the white balance and generate the R-Y/B-Y signals.

The prevideo signal obtained at TP3 (PREVIDEO) signal is fed to pin 34 of IC8.

The prevideo signal passes through the optional black clamp, Y gamma correction and Y AGC circuit in IC8.

The prevideo signal is then fed to the lowpass filter connected to the base of Q11 to remove the chroma component.

The Y signal, thus made, is amplified by Q11 and Q12 and fed to pin 7 of IC5 through buffer Q15.

The 1H-delayed Ysignal is obtained at pin 2 of IC5 is supplied to pin 2 of IC8 through VR2 (V. APERTURE BALANCE) and Q14 while the non-delayed Ysignal obtained at the collector of Q12 is forwarded to pin 3 of IC8 through buffer Q13 to generate the vertical aperture signal.

The Ysignal obtained at pin 4 of IC8 is fed to pin 15 of IC9 and the delay line CF12 through lowpass filter CF8 and CF10, VR11 (Y GAIN) and buffer Q30 in order to generate the horizontal aperture signal.

The chroma signal pressing is as follows.

The prevideo signal after passing through the OB clamp and pedestal set circuit in IC8 is detected by the sample hold circuit and lowpass filter in IC8 and R-G and B-G signals are generated.

The white balance for R-G and B-G is set by the DC voltage fed to pin 8 (R-Y) and pin 9 (B-Y) of IC8.

The R-G and B-G signals are then mixed by the subamp after white-clipped and obtained at pin 20 of IC8 (TP6).

The chroma signal through buffer Q28 is fed to the chroma gamma correction and AGC circuit through pin 38 of IC8 and obtained at pin 26 of IC8.

The chroma signal is then fed to pin 9 of 1H-delay IC5 through buffer Q16.

1H-delayed chroma signal obtained at pin 16 of IC5 through buffer Q32 and non-delayed chroma signal through buffer Q17 are supplied to pins 17 and 18 of IC8 respectively.

The R-Y and B-Ysignals demodulated inside IC8 are obtained at pin 15 (R-Y) and pin 12 (B-Y) of IC8 and supplied to the Y/C Encoder IC9 through lowpass filter CF13 and CF14.

6-3 Y/C Encoder Circuit

This circuit consisting of IC9, Q20-Q23, Q33, Q34, Q305 encode the Y, R-Y and B-Y signal to composite prevideo signal. The R-Y signals fed to pin 3 of IC9 is obtained at pin 6 of IC9 and fed to the modulator in IC9 through pin 34 of IC9.

The B-Y signals fed to pin 20 of IC9 is obtained at pin 18 of IC9 and fed to the modulator in IC9 through pin 32 of IC9.

The modulated chrome signal obtained at pin 46 of IC9 is fed to pin 27 of IC9 through amplifier Q34 and Q33 to be mixed with Ysignal.

The Ysignal supplied to the to the pin15 of IC9 and delay line CF12 are fed to the horizontal aperture circuit in IC9.

The Y signal is then obtained at pin 11 of IC9 and fed to the Y/C mixing circuit in IC9 through pin 13, 22 and 30 of IC9.

The composite video signal obtained at pin 28 of IC9 is forwarded to pin 1 of CN5 (VIDEO OUT) through amplifier Q304,Q305 Q20 through Q23.

6-4 Sync Generator Circuit

This circuit generates the pulses necessary to produce the videosignal.

The INT 17MHz oscillator is composed of IC304, Q302, X301, D304. The oscillation output is supplied to pin4 of IC303. IC3 generates subcarrier, sync, VD, BFP, WHD, BLK and clamp pulse (CP).

The pin identification of sync generator IC303 (MN676021PDS) is as follows.

Pin No.	Name	In/Out	Description
1	VDD1	In	Power
2	VSS1	---	Ground
3	EX4FSC	In	External 17.7MHz
4	4FSC OSC	In	Internal 17.7MHz
5	4FSC OSC	Out	Internal 17.7 MHz
6	SC1	Out	Subcarrier 1
7	SC2	Out	Subcarrier 2
8	BSC	---	Not Used
9	VPCO	Out	Vertical Reset Pulse Comparator
10	EXT/INT	---	EXT/INT Select
11	LSWCONT	In	Line Switch Cont
12	LSW	Out	Line Switch
13	V.RESET	In	Vertical Reset
14	EX282FH	In	External Frequency (4.40MHz)
15	282FHO	Out	Internal Frequency (4.40MHz)
16	282FHI	In	Internal Frequency (4.40MHz)
17	HPCO	Out	Phase Comparator Out
18	SCBLK	Out	SC Blanking Out
19	BFP	Out	Burst Flag Pulse
20	WBLK	Out	Wide Blanking
21	CP2	Out	Clamp Pulse 2
22	CP 1V	---	Not Used
23	C BLK	Out	Composite Blanking
24	WHD	Out	Wide Horizontal Drive
25	VD	Out	Vertical Drive Pulse
26	SYNC	Out	Sync Pulse
27	VSS2	---	Ground
28	VDD2	---	Power

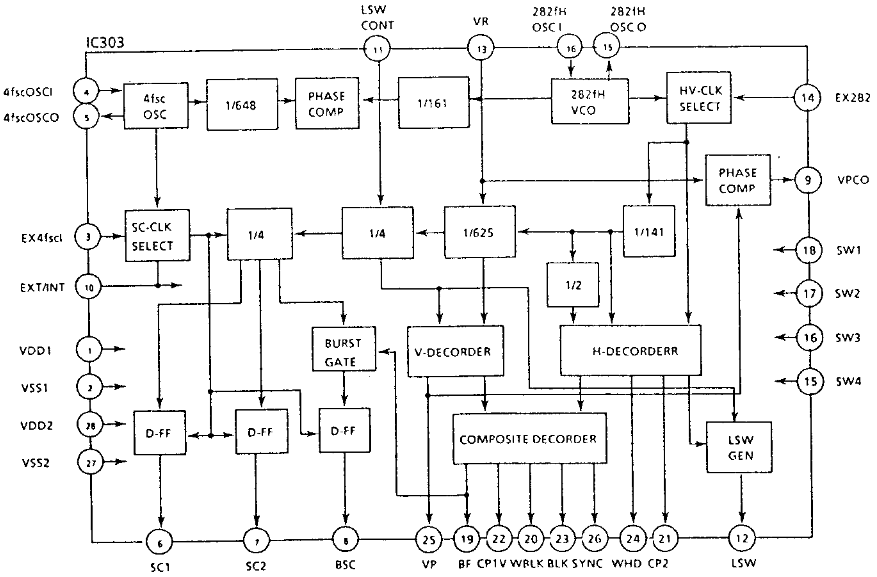

IC303
LSW CONT
VR
282fH OSC I
282fH OSC O
4fscOSCI
4fscOSCO
4fsc OSC
1/648
PHASE COMP
1/161
282fH VCO
HV-CLK SELECT
EX282
PHASE COMP
VPCO
EX4fscl
SC-CLK SELECT
1/4
1/4
1/625
1/141
1/2
SW1
SW2
SW3
SW4
EXT/INT
VDD1
VSS1
VDD2
VSS2
BURST GATE
V-DECORDER
H-DECORDERR
D-FF
D-FF
D-FF
COMPOSITE DECORDER
LSW GEN
4
5
3
10
1
2
28
27
11
13
16
15
14
9
18
17
16
15
6
7
8
25
19
22
20
23
26
24
21
12
SC1
SC2
BSC
VP
BF
CP1V
WBLK
BLK
SYNC
WHD
CP2
LSW

Fig. 6-3 Block Diagram of IC303

6-5 Drive Pulse Generator circuit

This circuit consisting of IC301 and IC1 receives vertical drive (VD) pulse and wide horizontal drive (WHD) pulse from IC303, and generates CCD drive pulses and other pulses.

The VCO circuit consists of D302, D303, C306, C307, C308, L301 (19MHz VCO ADJ) with oscillator inside IC301 generates 19MHz signal. This signal is obtained at pin 5 of IC301 and supplied to pin 44 of IC301.

In IC307, phase of the clock pulse routed to pin 1 and WHD pulse to pin 15 are compared and makes VCO control bias. This bias obtained at pins 5 of IC302 is supplied through buffer Q301 to VCO circuit for forming PLL circuit to stabilize the oscillation frequency.

The pin identification of CCD drive pulse generator IC3 is as follows ;

Pin No.	Pin Name	In/Out	Description
1	XO	Out	Oscillator
2	FCX2	In	Not used
3	CLK	Out	Clock Signal
4	SMPL	In	Sampling Clock
5	TEST	In	Not used
6	TEST1	In	Not used
7	SS1	In	Not used
8	SS2	---	Not Used
9	PNSW	In	NTSC/PAL Switch (H : NTSC, L : PAL)
10	PBLK	Out	Preblanking
11	CPOB	Out	OB Clamp Pulse
12	FH2	Out	1/2 fH Pulse
13	HD	In	H. Drive Pulse
14	VD	In	V. Drive Pulse
15	V1	Out	V. Transfer Pulse 1 (øV1)
16	V2	Out	V. Transfer Pulse 2 (øV2)
17	VDD	In	+ 5V DC Power
18	VSS2	---	Ground
19	V3	Out	V. Transfer Pulse 3 (øV3)
20	V4	Out	V. Transfer Pulse 4 (øV4)
21	CH1	Out	Charge Pulse for øV1
22	CH2	Out	Charge Pulse for øV3
23	CLR	In	Internal Clear (H:Normal, L:Clear)
24	H3 4	Out	H. Transfer Pulse 3,4 (øH3, øH4)
25	H1 2	Out	H. Transfer Pulse 1,2 (øH1, øH2)
26	R	Out	Reset Pulse (øR)
27	RWI	In	øR Width Control
28	RWO	Out	øR Width Control
29	DP3	Out	Sample Hold Pulse
30	I3	In	Not Used
31	DP2	Out	Data Pulse-2
32	I2	In	Not Used
33	DP4	Out	Data Pulse-4
34	DP1	Out	Data Pulse-1
35	Q3	Out	Sample Pulse
36	Q2	Out	Sample Pulse
37	SP0	Out	Not Used
38	SP2	Out	Sample Pulse-2
39	VSS1	In	Ground
40	VDD2	In	+ 5V DC Power
41	Q1	Out	Sample Pulse Phase Control
42	I1	In	Sample Pulse Phase Control
43	SP1	Out	Sample Pulse-1
44	X I	In	2f Clock

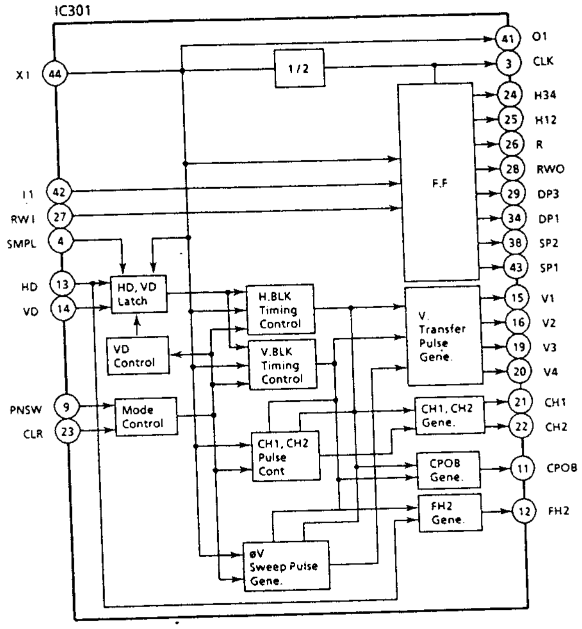

IC301
X1
44
I1
42
RWI
27
SMPL
4
HD
13
VD
14
PNSW
9
CLR
23
1/2
F.F
HD, VD Latch
VD Control
Mode Control
H.BLK Timing Control
V.BLK Timing Control
CH1, CH2 Pulse Cont
øV Sweep Pulse Gene.
V. Transfer Pulse Gene.
CH1, CH2 Gene.
CPOB Gene.
FH2 Gene.
41
O1
3
CLK
24
H34
25
H12
26
R
28
RWO
29
DP3
34
DP1
38
SP2
43
SP1
15
V1
16
V2
19
V3
20
V4
21
CH1
22
CH2
11
CPOB
12
FH2

Fig. 3-4 Block Diagram of IC301

IC1 is a pulse mixer and level converter and its block diagram is as follows.

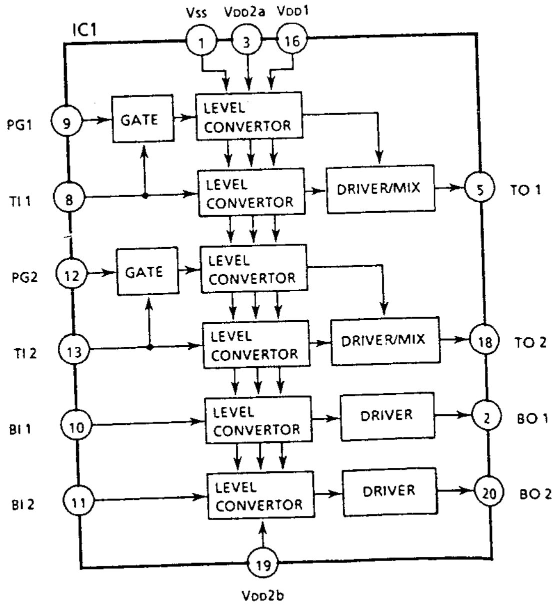

Vss
VDD2a
VDD1
IC1
1
3
16
PG1
9
GATE
LEVEL CONVERTOR
TI 1
8
LEVEL CONVERTOR
DRIVER/MIX
5
TO 1
PG2
12
GATE
LEVEL CONVERTOR
TI 2
13
LEVEL CONVERTOR
DRIVER/MIX
18
TO 2
BI 1
10
LEVEL CONVERTOR
DRIVER
2
BO 1
BI 2
11
LEVEL CONVERTOR
DRIVER
20
BO 2
19
VDD2b

Fig. 3-5 Block Diagram of IC1

ADJUSTMENT LIST

Adjustment List

Use the table listed below for your quick reference on the adjustments and their pages.

Page	Subject	Standard	Adjust	Test Point	Board
14	+ 8.6V adjustment	8.6 ± 0.05V	VR2	TP2	Power Board
14	+ 4.8V adjustment	4.8 ± 0.05V	VR1	TP1	Power Board
14	Subcarrier adjustment	2.5 ± 0.1V, 4.433618MHz ± 10Hz	CT2,VR301	TP301, TP303	Process Board
14	VCO adjustment	2.3 ± 0.1V	L301	TP304	Process Board
14	ALC adjustment	0.3 ± 0.01V	VR1	TP3	Process Board, Head Board
15	CCD bias adjustment	Minimum	VR2	VIdeo Output	Head Board
15	Confirmation on ALC adjustment	0.3 ± 0.01V	-------	------	---------------------
15	OB offset adjustment	Flat	VR5	TP7	Process Board
15	AGC gain adjustment	0.35 ± 0.01V	VR9	TP7	Process Board, Power Board
16	AWC preset adjustment	Minimum	VR5, VR6	TP6	Process Board, Power Board
16	Chroma balance adjustment	Same level	VR3	TP9	Process Board
16	Chroma coarse adjustment	Appropriate position	VR13	TP4	Process Board
16	Carrier balance & White balance	Center position	VR4, VR6, VR7, VR8	TP4	Process Board
17	Vertical aperture adjustment	Minimum	VR2	TP8	Process Board
17	Pedestal level adjustment	25 ± 0.01V	VR15	TP4	Process Board
17	Video level adjustment	0.7 ± 0.05V	VR11	TP4	Process Board
17	Burst phase adjustment	90° ± 2°	VR16	TP4	Process Board
18	Burst level adjustment	0.3V ± 0.02V	VR14	TP4	Process Board
18	Croma gain adjustment	R:200%, Y:100%	VR9, VR10	TP4	Process Board
18	Carrier balance & White balance fine adjustment	Center	VR4, VR6, VR7, VR8	TP4	Process Board
18	Carrier fine adjustment	Appropriate position	VR13	TP4	Process Board
19	ATW gain adjustment	Minimum	VR7, VR8	TP6	Process Board, Power Board
19	Croma crip adjustment	2.13 ± 0.02V	VR12	TP20	Process Board
19	Confrmation of video output	---------	---------	TP4	Process Board

ADJUSTMENT PROCEDURE

1. TEST EQUIPMENT REQUIRED

The following equipment is required for adjusting the Color camera WV-F5E.

- Oscilloscope
- Digital Voltmeter (DVM)
- Vectorscope
- Frequency Counter
- Color Video Monitor
- Lighting (140 footcandles (1400 lux), 3200°K)
- Lightmeter
- Lamp (40 watt)
- Logarithmic Gray Scale Chart (Part No. YWV2310RB99) (Fig. 1-1)

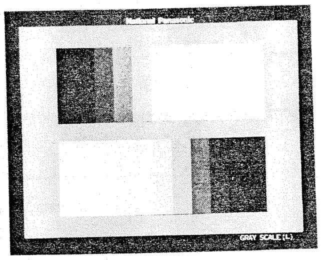

National Panasonic
GRAY SCALE (L)

Fig. 1-1

- Color Chart (Part No. YWV2100RB98) (Fig. 1-2)

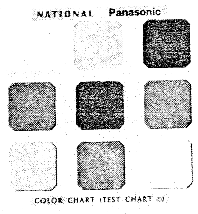

NATIONAL Panasonic
COLOR CHART (TEST CHART ☐)

Fig. 1-2

2. DISASSEMBLY PROCEDURE FOR ADJUSTMENT

2-1 Camera Control Unit

- Remove four screws of the camera shoe and remove four screws on the bottom plate.

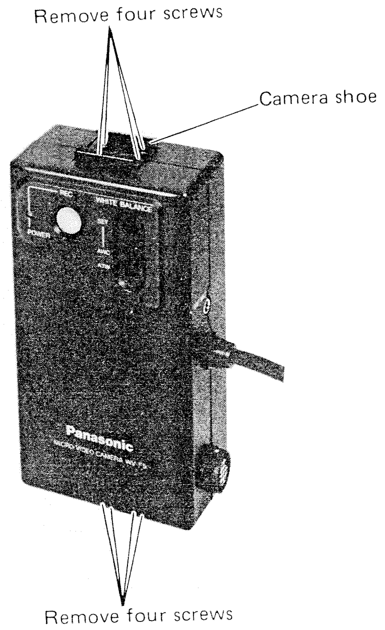

Remove four screws
Camera shoe
REC
WHITE BALANCE
POWER
Panasonic
Remove four screws

Fig. 2-1-1

- Remove two screws holding the process board. (Fig. 2-1-2)

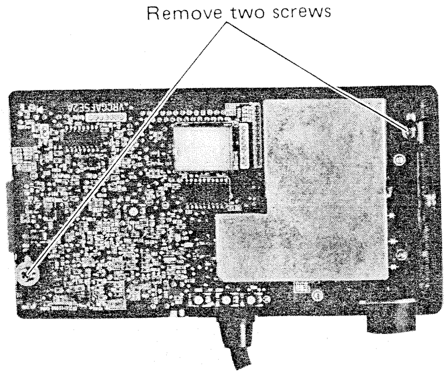

Remove two screws

Fig. 2-1-2

- Remove four screws holding the power board.(Fig.2-1-3)

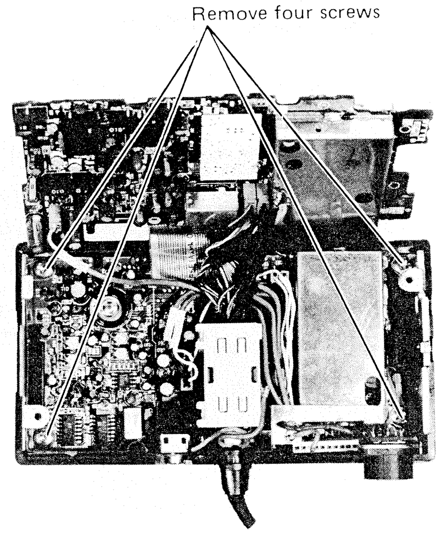

Remove four screws

Fig. 2-1-3

2-2 Camera Head

- Remove two screws on the camera head.
- Slide off the rear camera cover.

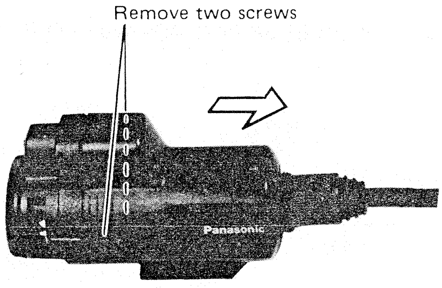

Remove two screws
Panasonic

Fig. 2-2-1

3. REPLACEMENT PROCEDURE OF THE PARTS OF THE CAMERA HEAD

3-1 Replacement of the microphone

- Remove three screws on the Lens hood.
- Pull out the lens hood.
- Slide out the front camera case.

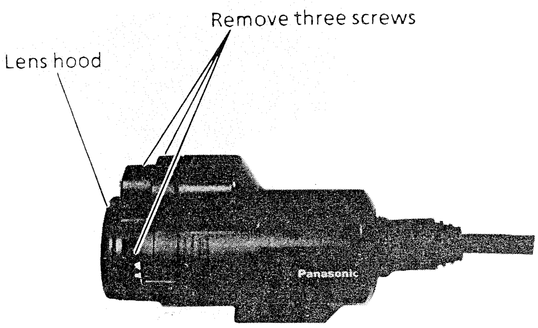

Remove three screws
Lens hood
Panasonic

Fig. 3-1-1

- Resolder the jumper resister.
- Remove one screw on the microphone shield plate.
- Pull out the microphone unit and replace with new one.

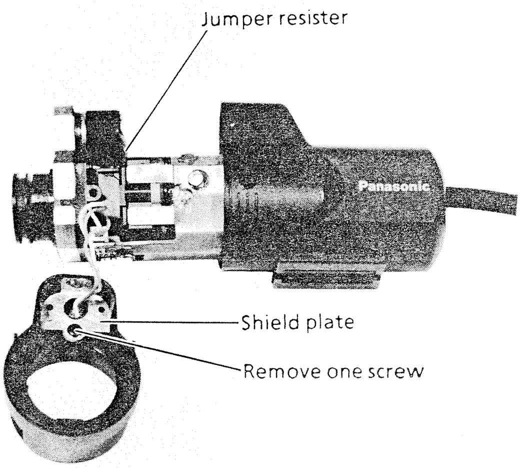

Jumper resister
Panasonic
Shield plate
Remove one screw

Fig. 3-1-2

- Continue this procedure for the CCD replacement

3-2 Replacement of the CCD

- Remove three screws on the focus ring.
- Pull out the lens hood.
- Slide out the front camera case.

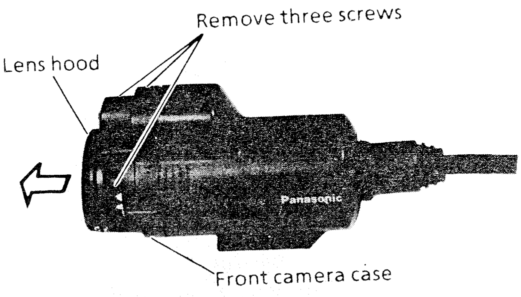

Remove three screws
Lens hood
Panasonic
Front camera case

Fig. 3-2-1

- Remove two screws on the lens unit.

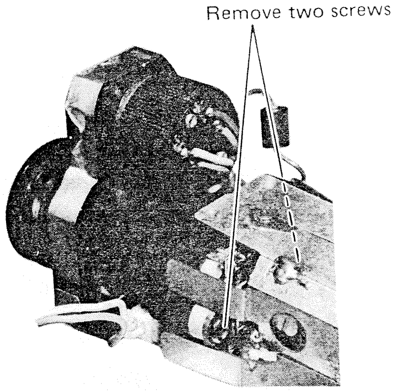

Remove two screws

Fig. 3-2-2

- Replace the CCD assembly unit with new one.

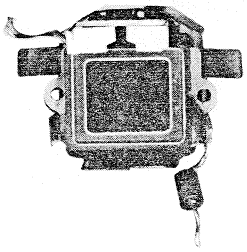


Fig. 3-2-3

- Continue this procedure for the lens replacement.

3-3 Replacement of the lens

- Turn the lens unit C.C.W. to remove it.
- Replace the lens unit with new one.

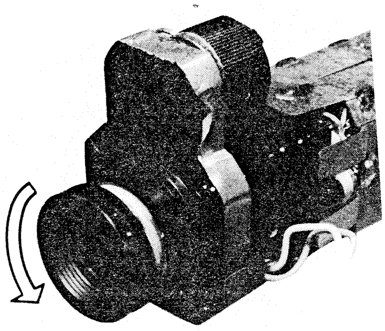
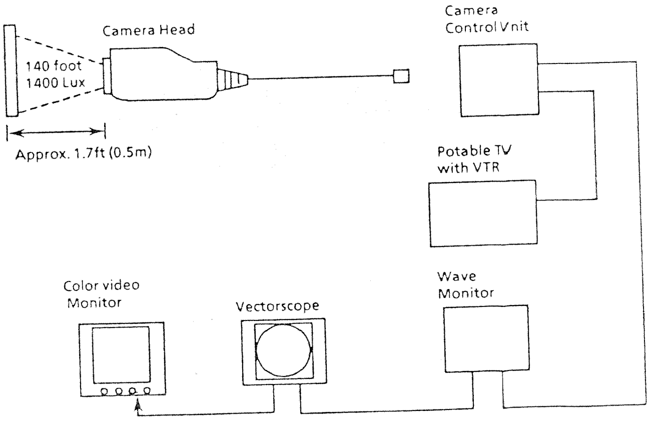


Fig. 3-3-1

- Reassemble the camera head by reverse procedure of disassembling.

4. ADJUSTMENT PROCEDURE

4-1 Connection and Setting Up for Adjustment


Camera Head
140 foot
1400 Lux
Approx. 1.7ft (0.5m)
Camera Control Vnit
Potable TV with VTR
Wave Monitor
Color video Monitor
Vectorscope

Connection

- Connect the Video Output socket of the potable TV with VTR to the Video Input connector of the color video monitor through the vectorscope using a coaxial cable.
- Terminate the VIDEO INPUT of the color video monitor with 75 ohms.
- Supply the power to the Camera Control Unit from the portable TV with VTR.

Disassembling

- Disassemble the Camera Control Unit and Camera Head according to the "DISASSEMBLY PROCEDURE FOR ADJUSTMENT" on page 11.

Setting Up

• Light :	Incident light intensity on chart : 140 footcandles (1400 lux) Color temperature : 3200°K
• Test Charts :	Logarithmic gray scale chart (YWV2310RB99) Color chart (YWV2100RB98) Ball/White set chart (YWV2100RB03) White chart or white paper

- Set the White Balance Switch on Camera Control Unit to AWC position.
- Turn VR12 (C.CLIP) fally counterclockwise.

4-2 Adjustment Procedure

- See page 19 for the location of the test points and adjusting controls.

(1) +8.6V adjustment

Test point :	**TP1 (+ 8.6V)**	**Power board**
Adjust :	**VR1 (+ 8.6V ADJ)**	**Power board**

- Connect the digital voltmeter (DVM) to TP1 (+ 8.6V).
- Adjust VR1 (+ 8.6V ADJ) for + 8.6 ± 0.05V.

(2) +4.8 adjustment

Test point :	**TP2 (+ 4.8V)**	**Power board**
Adjust :	**VR2 (+ 4.8V ADJ)**	**Power board**

- Connect the digital voltmeter (DVM) to TP2 (+ 4.8V).
- Adjust VR2 (+ 4.8V ADJ) for + 4.8 ± 0.05V.

(3) Subcarrier adjustment

Test point :	**TP301 (SC)**	**Process board**
	TP303 (SC DC)	**Process board**
Adjusts :	**CT2 (SC ADJ)**	**Process board**
	TP301 (SC)	**Process board**

- Connect the oscilloscope to TP303 and adjust CT2 for 2.5 ± 0.1V. (Use 10 : 1 probe)
- Connect the frequency counter to TP301 and adjust VR301 for 4433618.75 ± 10Hz.
- Repeat above procedures to have correct frequency.

(4) VCO adjustment

Test point :	**TP304 (H.PLL)**	**Process board**
Adjust :	**L301 (H.PLL)**	**Process board**

- Connect the digital voltmeter (DUM) to TP304 (H.PLL).
- Adjust L301 (H.PLL) for + 2.3 ± 0.1V.

(5) ALC adjustment

Test points :	**TP3 (PREVIDEO)**	**Process board**
Adjust :	**VR1 (ALC ADJ)**	**Camera Head**

- Aim the camera at the gray scale chart.
- Connect the oscilloscope to TP3 (PREVIDEO) .
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR1 so that the signal level at TP3 becomes 0.3 ± 0.1V. (Fig. 4-2-1)

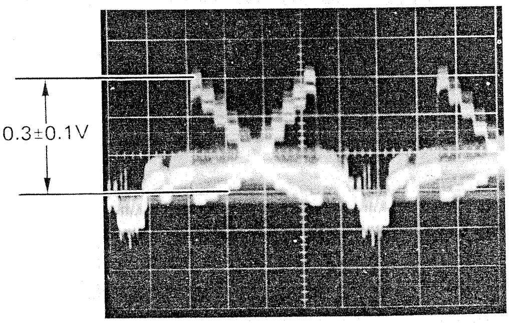


Fig. 4-2-1

(6) CCD bias adjustment

Adjust : **VR2 (CCD BIAS)** **Head board**
Observe : **Color video monitor**

- Aim the camera at a 40-watt lamp placed in front of the dark background. (Fig. 4-2-2)

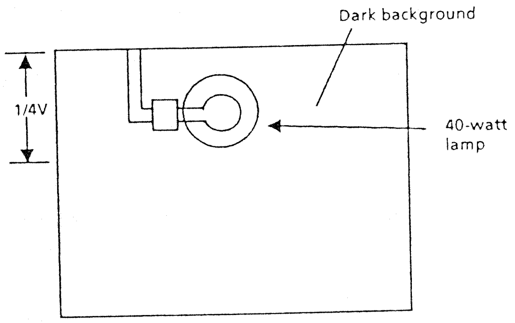
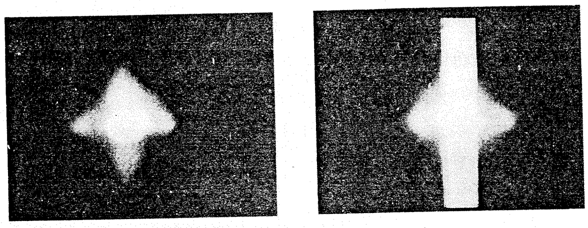


Fig. 4-2-2

- While observing the picture on the color video monitor, turn VR3 (CCD BIAS) clockwise or counterclockwise and stop it at a point where the blooming and noise are minimized. (Fig. 4-2-3)



GOOD NO GOOD

Fig. 4-2-3

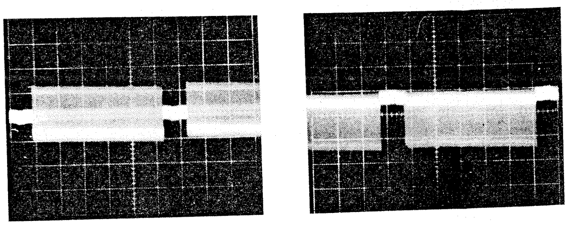
(7) Confirmation on ALC adjustment

- Confirm the level of TP3 is 0.3 ± 0.01V, If it has been changed, repeat the item-(5) and (6).

(8) OB offset adjustment

Test point : **TP7 (YH)** **Process board**
Adjust : **VR5 (OB LEVEL)** **Process board**

- Cap on the lens.
- Connect the oscilloscope to TP7 (YH).
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR5 (OB LEVEL) so that the OB level and black level at TP7 becomes flat. (Fig. 4-2-4)
- Remove cap on the lens.



GOOD NO GOOD

Fig. 4-2-4

(9) AGC gain adjustment

Test point : **TP7 (YH)** **Process board**
Adjust : **VR9 (AGC SET)** **Power board**

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to TP7 (YH).
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR9 (AGC SET) so that the signal level at TP7 becomes 0.35 ± 0.01V. (Fig. 4-2-5)

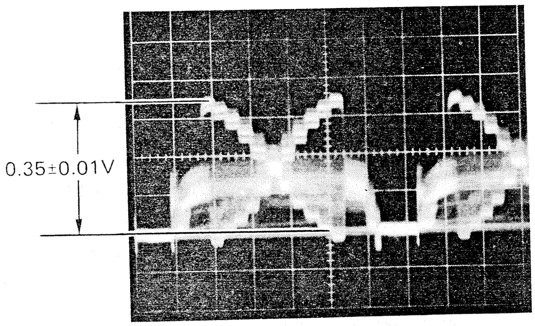


Fig. 4-2-5

(10) AWC preset adjustment

Test point :	**TP6 (CHROMA)**	**Process board**
Adjusts :	**VR5 (R -Y PRESET)**	**Power board**
	VR6 (B -Y PRESET)	**Power board**

- Aim the camera at the color chart.
- Turn the SW2 (ATW/AWC Switch) on the Power board to AWC position.
- Ground the TP3 (RESET) on the Power board.
- Connect the oscilloscope to TP6 (CHROMA).
- Adjust VR5 (R-Y PRESET) and VR6 (B-Y PRESET) so that the waveform becomes minimum. (Fig. 4-2-6)

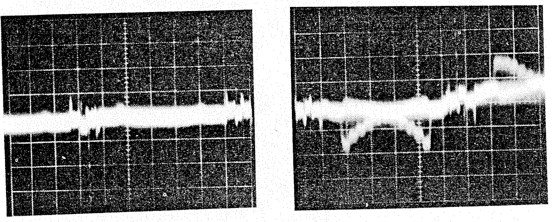

GOOD NO GOOD

Fig. 4-2-6

(11) Chroma balance adjustment

Test point :	**TP9 (R -Y)**	**Process board**
Adjust :	**VR3(CHROMA BAL)**	**Process board**

- Aim the camera at the color chart.
- Connect the oscilloscope to TP9 (R-Y).
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR3 (CHROMA BAL) so that the chroma level of every H-period becomes same. (Fig. 4-2-7)
- Confirm that no flicker is seen on the vector scope.

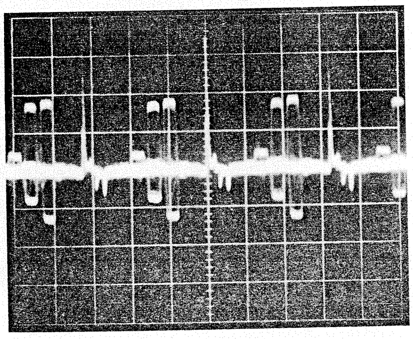


Fig. 4-2-7

(12) Chroma coarse adjustment

Test point :	**TP4 (VIDEO OUT)**	**Process board**
Adjust :	**VR13 (HUE)**	**Process board**

- Aim the camera at the color chart.
- Confirm that VR12 (CHROMA CLIP) is turned fully counterclockwise.
- Adjust VR13 (HUE) so that the chroma phase becomes appropriate position.

(13) Carrier balance & White balance coarse adjustment

Test point :	**TP4 (VIDEO OUT)**	**Process board**
Adjusts :	**VR4 (CARRIER BAL-1)**	**Process board**
	VR6 (CARRIER BAL-2)	**Process board**
	VR7 (WHITE BAL-1)	**Process board**
	VR8 (WHITE BAL-2)	**Process board**

a. Carrier balance coarse adjustment

- Cap on the lens.
- Connect the vectorscope to TP4 (VIDEO OUT)
- Adjust VR4 (CARRIER BAL-1) and VR6 (CARRIER BAL-2) so that the dot on the vectorscope falls into center.

b. White balance coarse adjustment

- Aim the camera at the logarithmic gray scale chart.
- Connect the vectorscope to TP4 (VIDEO OUT)
- Adjust VR7 (WHITE BAL-1) and VR8 (WHITE BAL-2) so that the dot on the vectorscope falls into center.
- Repeat above procedure.

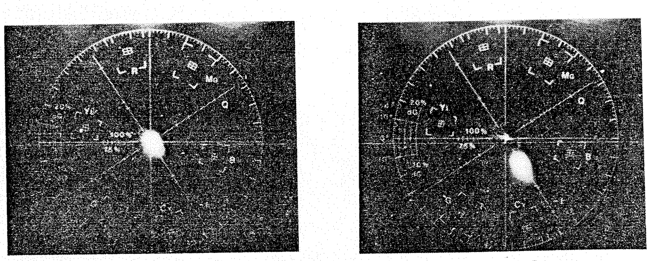
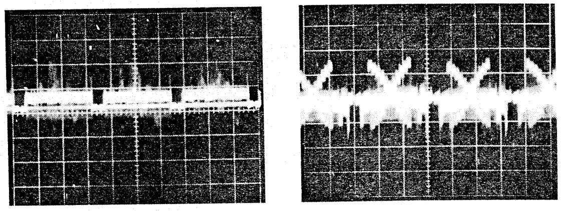

GOOD NO GOOD

Fig. 4-2-8

(14) Vertical aperture adjustment

Test point :	TP8 (V AP)	Process board
Adjust :	VR2 (V AP BAL)	Process board

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to TP8 (V AP).
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR2 (V AP BAL) so that the gray scale waveform becomes minimum. (Fig. 4-2-9)



GOOD NO GOOD

Fig. 4-2-9

(15) Pedestal level adjustment

Test point :	**TP4 (VIDEO OUT)**	Process board
Adjust :	**VR15 (PEDESTAL)**	Process board

- Cap on the lens.
- Connect the oscilloscope to TP4 (VIDEO OUT)
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR15 (PEDESTAL) so that the Pedestal level becomes 25 ± 0.01V.(Fig. 4-2-10)

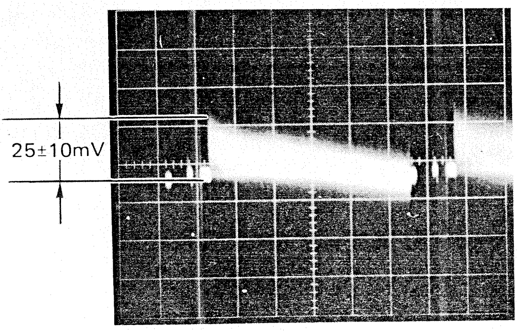


Fig.4-2-10

(16) Video level adjustment

Test point :	**TP4 (VIDEO OUT)**	**Process board**
Adjust :	**VR11 (Y GAIN)**	**Process board**

- Aim the camera at the logarithmic gray scale chart.
- Connect the oscilloscope to TP4 (VIDEO).
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR11 (Y GAIN) so that the video signal level becomes 0.7 ± 0.05V. (Fig. 4-2-11)

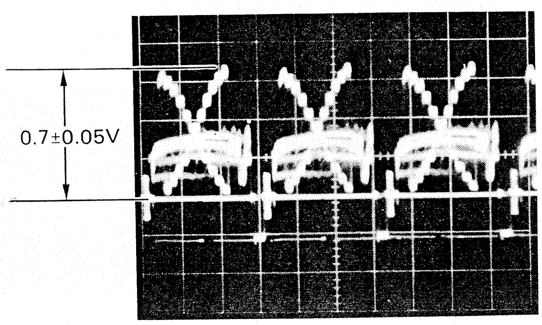


Fig. 4-3-11

(17) Burst phase adjustment

Test point :	**TP4 (VIDEO OUT)**	**Process board**
Adjust :	**VR16 (BURST PHASE)**	**Process board**

- Aim the camera at the color chart.
- Connect the oscilloscope to TP4 (VIDEO OUT).
- Adjust VR16 (BURST PHASE) so that the burst vectors position 90° ± 2° on the burst axis of the vectorscope. (Fig. 4-2-12)

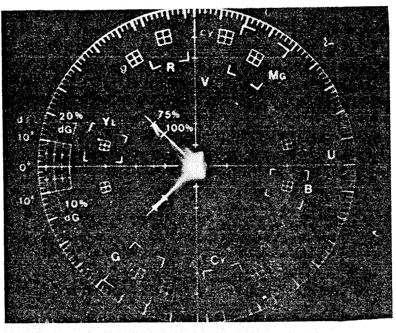


Fig. 4-2-12

(18) Burst level adjustment

Test point :	TP4 (VIDEO OUT)	Process board
Adjust :	VR14 (BURST GAIN)	Process board

- Cap on the lens.
- Connect the vectorscope to TP4 (VIDEO OUT)
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR14 (BURST GAIN) so that the burst level becomes 0.3 ±0.002V.(Fig. 4-2-13)

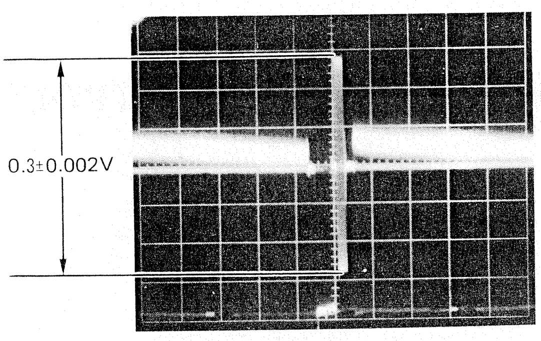


Fig. 4-2-13

(19) Chroma gain adjustment

Test point :	TP4 (VIDEO OUT)	Process board
Adjusts :	VR9 (R-Y GAIN)	Process board
	VR10 (B-Y GAIN)	Process board

- Aim the camera at the color chart.
- Connect the vectorscope to TP4 (VIDEO OUT).
- Adjust VR9 (R-Y GAIN) and VR10 (B-Y GAIN) so that the Red vector is 200% ± 15% compared with the burst level and the yellow vector is 100% ± 15% compared with the burst level. (Fig. 4-2-14)
- Confirm that the Red phase is 104° ± 5° and yellow phase is 165° ± 8°

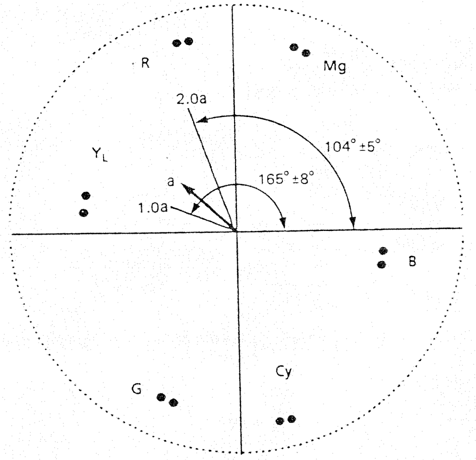


Fig. 4-2-14

(20) Carrier balance & White balance fine adjustment

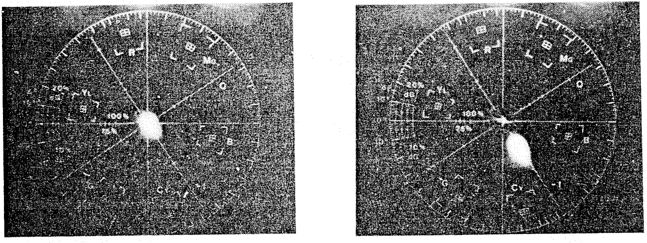
Test point :	TP4 (VIDEO OUT)	Process board
Adjusts :	VR4 (CARRIER BAL-1)	Process board
	VR6 (CARRIER BAL-2)	Process board
	VR7 (WHITE BAL-1)	Process board
	VR8 (WHITE BAL-2)	Process board

a. Carrier balance coarse adjustment

- Cap on the lens.
- Connect the vectorscope to TP4 (VIDEO OUT)
- Adjust VR4 (CARRIER BAL-1) and VR6 (CARRIER BAL-2) so that the dot on the vectorscope falls into center.

b. White balance coarse adjustment

- Aim the camera at the logarithmic gray scale chart.
- Connect the vectorscope to TP4 (VIDEO OUT)
- Adjust VR7 (WHITE BAL-1) and VR8 (WHITE BAL-2) so that the dot on the vectorscope falls into center.
- Repeat above procedure.



GOOD NO GOOD

Fig. 4-2-15

(21) Chroma fine adjustment

Test point :	TP4 (VIDEO OUT)	Process board
Adjust :	VR13 (HUE)	Process board

- Aim the camera at the color chart.
- Confirm that VR12 (CHROMA CLIP) is turned fully counterclockwise.
- Adjust VR13 (HUE) so that the chroma phase becomes appropriate position.

(22) ATW gain adjustment

Test point :	TP6 (CHROMA)	Process board
Adjusts :	VR7 (R -Y ATW)	Power board
	VR8 (B -Y ATW)	Power board

- Turn the SW2 (ATW/AWC) on the Power board to ATW position.
- Connect the oscilloscope to TP6.
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR7 (B-Y, ATW) and VR8 (R-Y, ATW) so that the waveform becomes minimum.

(23) Chroma crip adjustment

Test point :	**TP20**	**Process board**
Adjust :	**VR12 (CHROMA CLIP)**	**Process board**

- Aim the camera at the logarithmic gray scale chart.
- Confirm that VR12 (CHROMA CLIP) is turned fully counterclockwise.
- Connect the oscilloscope to TP20.
- Trigger the oscilloscope at H rate using TP302.
- Adjust VR12 (CHROMA CLIP) so that the 2.13 ± 0.02V.

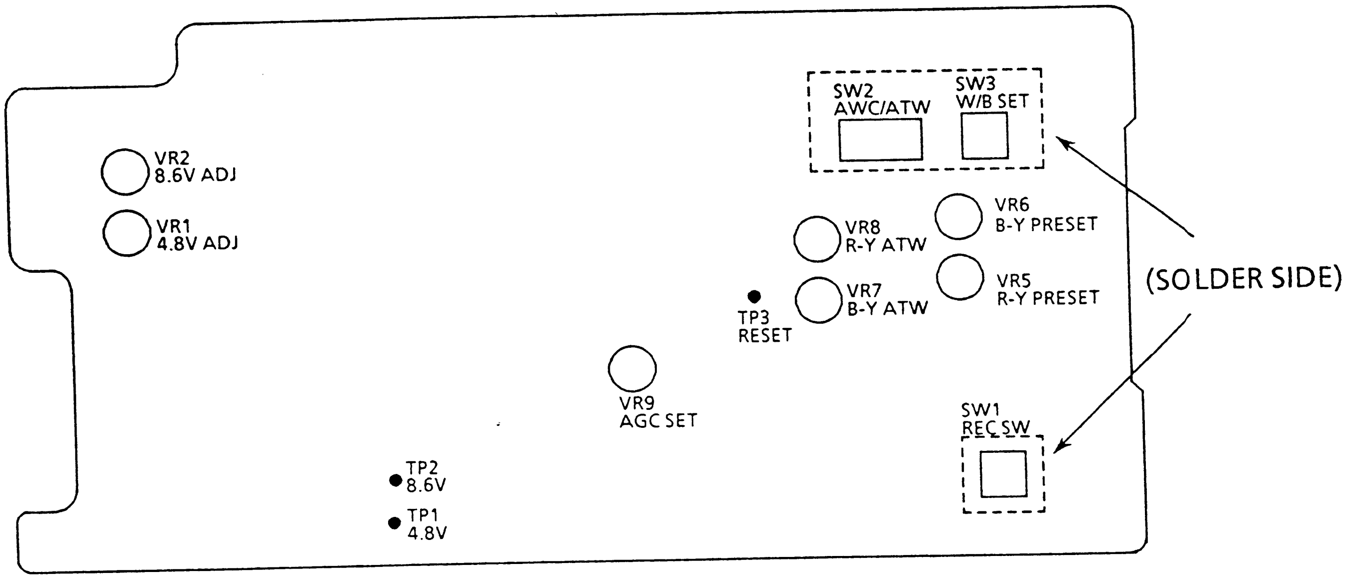
(24) Confirmation of video output

Test point :	**TP4 (VIDEO OUT)**	**Process board**

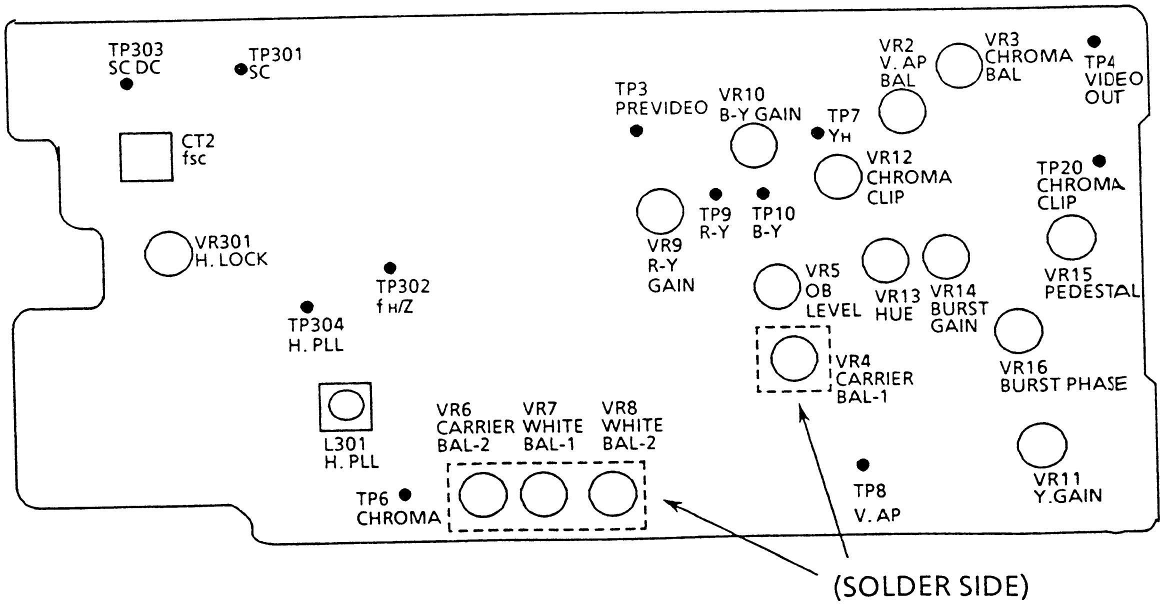
- Connect the oscilloscope to TP4.
- Confirm that the video level is 0.7 ± 0.1V and sync level is 0.3 ± 0.05V and Burst level is 0.3 ± 0.05V.
- Cap on the lens.
- Confirm that the Dark level is 25V ± 25mV.

LOCATION OF TEST POINTS AND ADJUSTING CONTROLS

POWER BOARD


SW2
AWC/ATW
SW3
W/B SET
VR2
8.6V ADJ
VR1
4.8V ADJ
VR8
R-Y ATW
VR6
B-Y PRESET
VR7
B-Y ATW
VR5
R-Y PRESET
(SOLDER SIDE)
TP3
RESET
VR9
AGC SET
SW1
REC SW
TP2
8.6V
TP1
4.8V

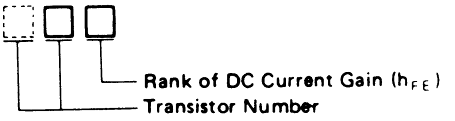
PROCESS BOARD


TP303
SC DC
TP301
SC
VR2
V. AP
BAL
VR3
CHROMA
BAL
TP4
VIDEO
OUT
TP3
PREVIDEO
VR10
B-Y GAIN
TP7
YH
CT2
fsc
VR12
CHROMA
CLIP
TP20
CHROMA
CLIP
TP9
R-Y
TP10
B-Y
VR9
R-Y
GAIN
VR301
H. LOCK
TP302
f H/Z
VR5
OB
LEVEL
VR13
HUE
VR14
BURST
GAIN
VR15
PEDESTAL
TP304
H. PLL
VR4
CARRIER
BAL-1
VR16
BURST PHASE
L301
H. PLL
VR6
CARRIER
BAL-2
VR7
WHITE
BAL-1
VR8
WHITE
BAL-2
TP6
CHROMA
TP8
V. AP
VR11
Y.GAIN
(SOLDER SIDE)

CHIP COMPONENTS

1. Chip Transistor

The transistor number is indicated on the top surface of the chip transistor using two alphabet letters or one numerical and two alphabet letters.


Rank of DC Current Gain (h_{FE})
Transistor Number

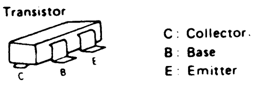
Transistor Number

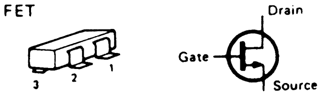
Letter	Transistor No.	Letter	Transistor No.
A	2SB709	X	2SD602A
B	2SB709A	Y	2SD601
C	2SB710	Z	2SD601A
D	2SB710A	1Z	2SD1030
E	2SA1022	1N	2SK199
F	2SA1034	1O	2SK198
H	2SA1035	1A	2SB799
I	2SB792	1B	2SB814
K	2SC2778	1C	2SB902
P	2SD814	1F	2SK321
Q	2SD813	1L	2SK247
R	2SC2480	1K	2SK316
S	2SC2405	1M	2SJ84
T	2SC2406	1T	2SC3077
U	2SC2404	1X	2SC2845
V	2SC2295	2B	2SK374
W	2SD602	2C	2SK116

Example

WQ ⟶ 2SD602 – Q
YQ ⟶ 2SD601 – Q
1BS ⟶ 2SB814 – S

Appearance and Symbols

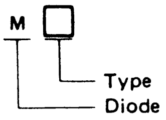

Transistor
C
B
E
C: Collector
B: Base
E: Emitter


FET
3
2
1
Drain
Gate
Source

	1	2	3
Except 2SK199	Drain	Source	Gate
2SK199	Gate	Drain	Source

2. Chip Diode

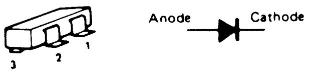
The diode number is indicated on the top surface of the chip diode using Two alphabet letters.


M
Type
Diode

Diode Number

Letter	Diode No.	Letter	Diode No.
MA	MA151A	MI	MA152K
MB	MA152A	MK	MA28W-B
MC	MA153	ML	MA28T-A
MD	MA28-A	MN	MA151WA
ME	MA28-B	MO	MA152WA
MF	MA28W-A	MT	MA151WK
MH	MA151K	MU	MA152WK

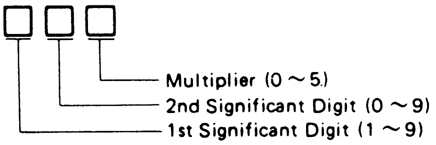
Appearance and Symbols


3
2
1
Anode
Cathode

	1	2	3
MA28/28W/28T	–	Anode	Cathode
MA151K/152K	–	Anode	Cathode
MA151A/152A	–	Cathode	Anode
MA151WK/MA152WK	Anode	Anode	Cathode
MA151WA/MA152WA	Cathode	Cathode	Anode
MA153	Cathode	Anode	Common

3. Chip Resistor

The resistor value is indicated on the bottom surface of the chip resistor using three digit numbers.


Multiplier (0 ~ 5)
2nd Significant Digit (0 ~ 9)
1st Significant Digit (1 ~ 9)

EXAMPLE:

330 ⟶ 33×10^0 = 33 ohms
561 ⟶ 56×10^1 = 560 ohms
123 ⟶ 12×10^3 = 12 kohms

Note: Zero ohm resistor (jumper chip) is colored red or green.

4. Chip Capacitor

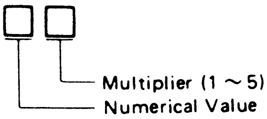
The capacitive value of replacement chip capacitors is indicated on the bottom surface. Original parts do not have value indication.

If the capacitive value is less than 100 pF, the value will be indicated by one or two digit number expressing the capacity directly in pF.

EXAMPLE:

0.5 ⟶	0.5 pF	2.5 ⟶	2.5 pF
75 ⟶	0.75 pF	33 ⟶	33 pF
1 ⟶	1 pF	82 ⟶	82 pF

If the capacitive value is 100 pF or greater, the value will be indicated by an alpha-numeric code. The letter precedes the number and expresses a numerical value to be multiplied by the number which follows.


Multiplier (1 ~ 5)
Numerical Value

Numerical Value

Letter	Value	Letter	Value
A	10	N	33
B	11	P	36
C	12	Q	39
D	13	R	43
E	15	S	47
F	16	T	51
G	18	U	56
H	20	V	62
J	22	W	68
K	24	X	75
L	27	Y	82
M	30	Z	91

* Letters I and O are not used

EXAMPLE:

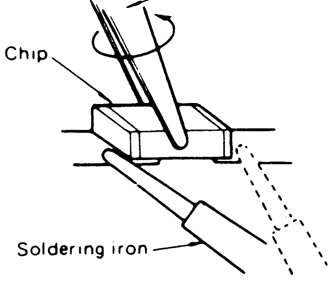
A1 ⟶ 10 x 10^{1} = 100 pF
N2 ⟶ 33 x 10^{2} = 3300 pF
S3 ⟶ 47 x 10^{3} = 47000 pF

5. Precautions in replacing the chip component

1. Make sure that the unit is turned OFF when replacing the chip.
2. Use tweezers to prevent any damage to the chip surface.
3. Do not re-use the chips after removal.
4. Do not rub the electrode of chips.
5. Do not subject the chips to excessive stress.
6. It is recommended that a pencil-type soldering iron to be used.
7. The solder whose diameter is less than 0.5 mm is recommended.
8. Do not heat the chip beyond 3 seconds
9. Maintain temperature control under 260°C (500°F) when soldering.

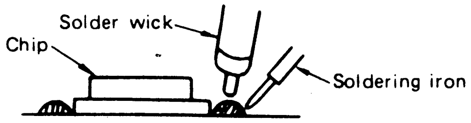
5-1 Removal (Transistor, Diode, Resistor and Capacitor)

1. Add the solder to both ends of the chip (three leads for chip transistor).
2. While attaching the soldering iron to both ends of the chip (three leads for chip transistor) as shown below, remove the chip by turning it with tweezers.
   Note Be careful not to damage other chips.

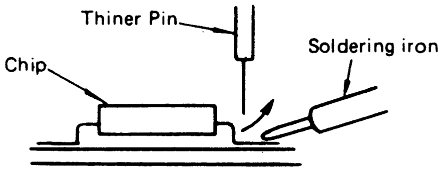

Tweezers
Chip
Soldering iron

5-2 Removal (IC)

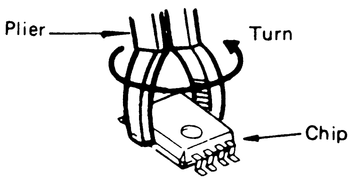
1. Add the solder wick and solder iron to each lead of the IC and remove solder.


Solder wick
Chip
Soldering iron

2. Add the solder iron to each lead of the IC and left each lead of the IC using thiner pin.

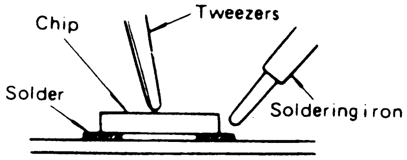

Thiner Pin
Chip
Soldering iron

3. Remove IC turning it with plier.

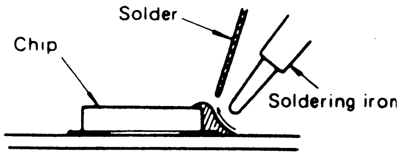

Plier
Turn
Chip

5-3 Mounting

1. Place the solder thinly on the chip mounting foil.
2. Solder the chip temporarily while holding the chip with the tweezers.

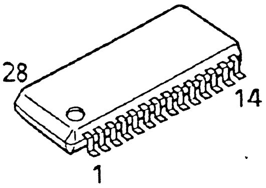

Chip
Tweezers
Solder
Soldering iron

3. Solder both ends of chip (three leads for chip transistor)

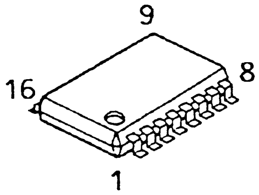

Solder
Chip
Soldering iron

APPEARANCE OF IC, TRANSISTOR AND DIODE

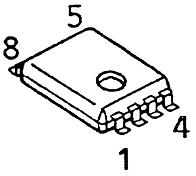
MN1551CCQ
MN676021PDS



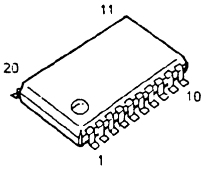
MN4052BS AN2011S
MN3820S YWFA7611M



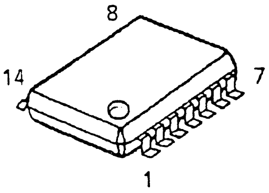
NJM2904M NJM4558M
NJM3414M AN1393S
AN1358S



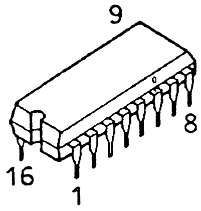
MN3107CS



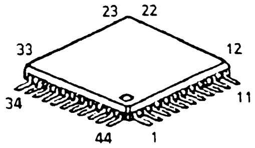
AN1324NS



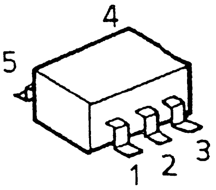
MN4053BS



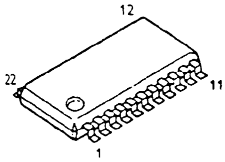
MN53015XBR
MN53003LVV


23 22
33
12
34
11
44
1

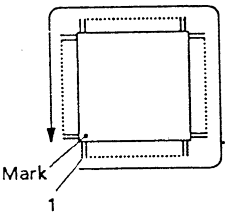
AN78L06M
YWTC7S08F



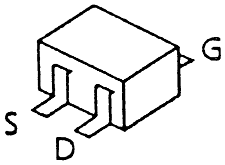
MN5117



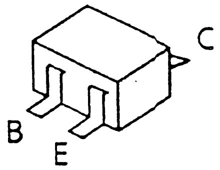
AN2154FAP
AN2254FAP



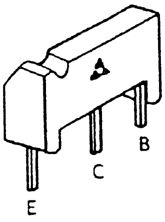
2SK662-PQR
2SK663-QRS



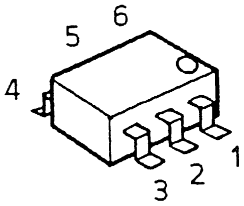
2SC3929-RS 2SD1819-QRS
2SB1218-QRS 2SA1462
2SC3931-CD 2SD601-RS
2SB709-QRS



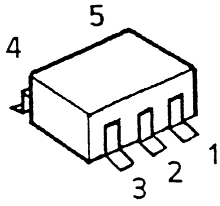
2SD1526



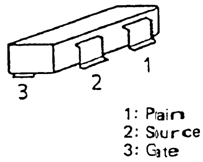
XN4501
XN4401



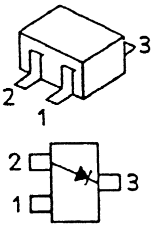
XN1401



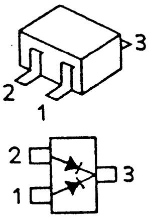
2SC3735 2SA1462
XN1501 UN2214
XN1401


1
2
3
1: Drain
2: Source
3: Gate

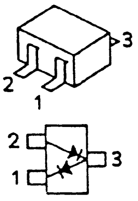
MA152K
MA141K



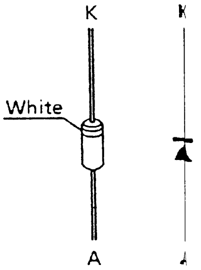
MA141WK



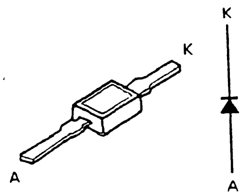
MA143 MA153
MA157TW



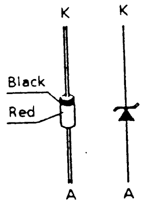
YWERA82004



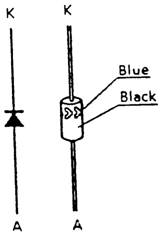
1SV153
MA729



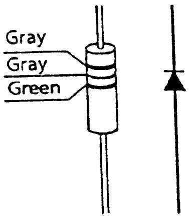
YWMA1120M
0A90A-R


K
K
Black
Red
A
A

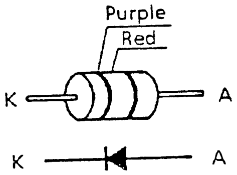
YWERA84009


K
K
Blue
Black
A
A

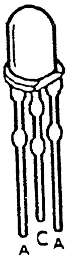
MA1068M


Gray
Gray
Green

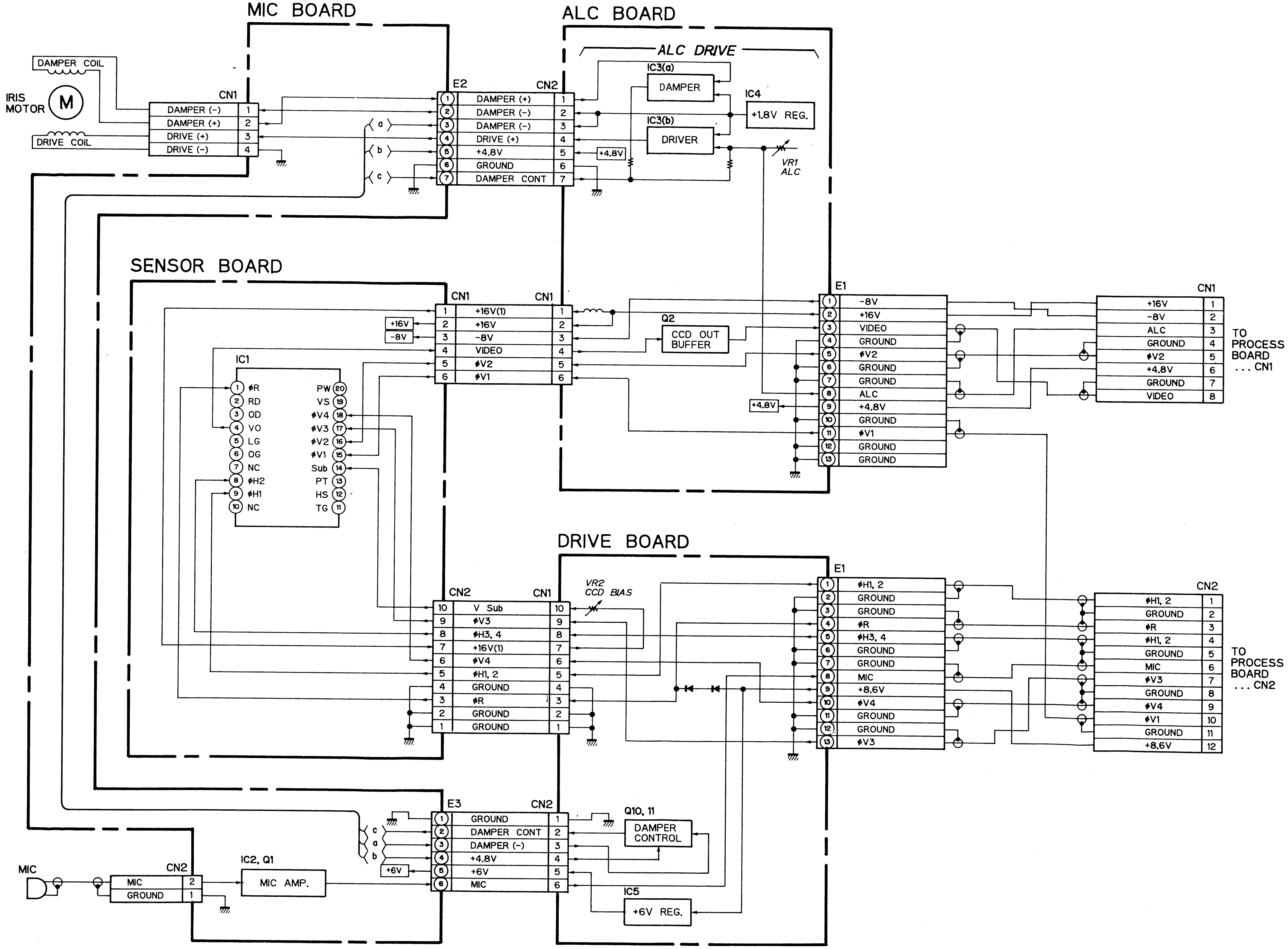
YWTC7S08F


Purple
Red
K
A
K
A

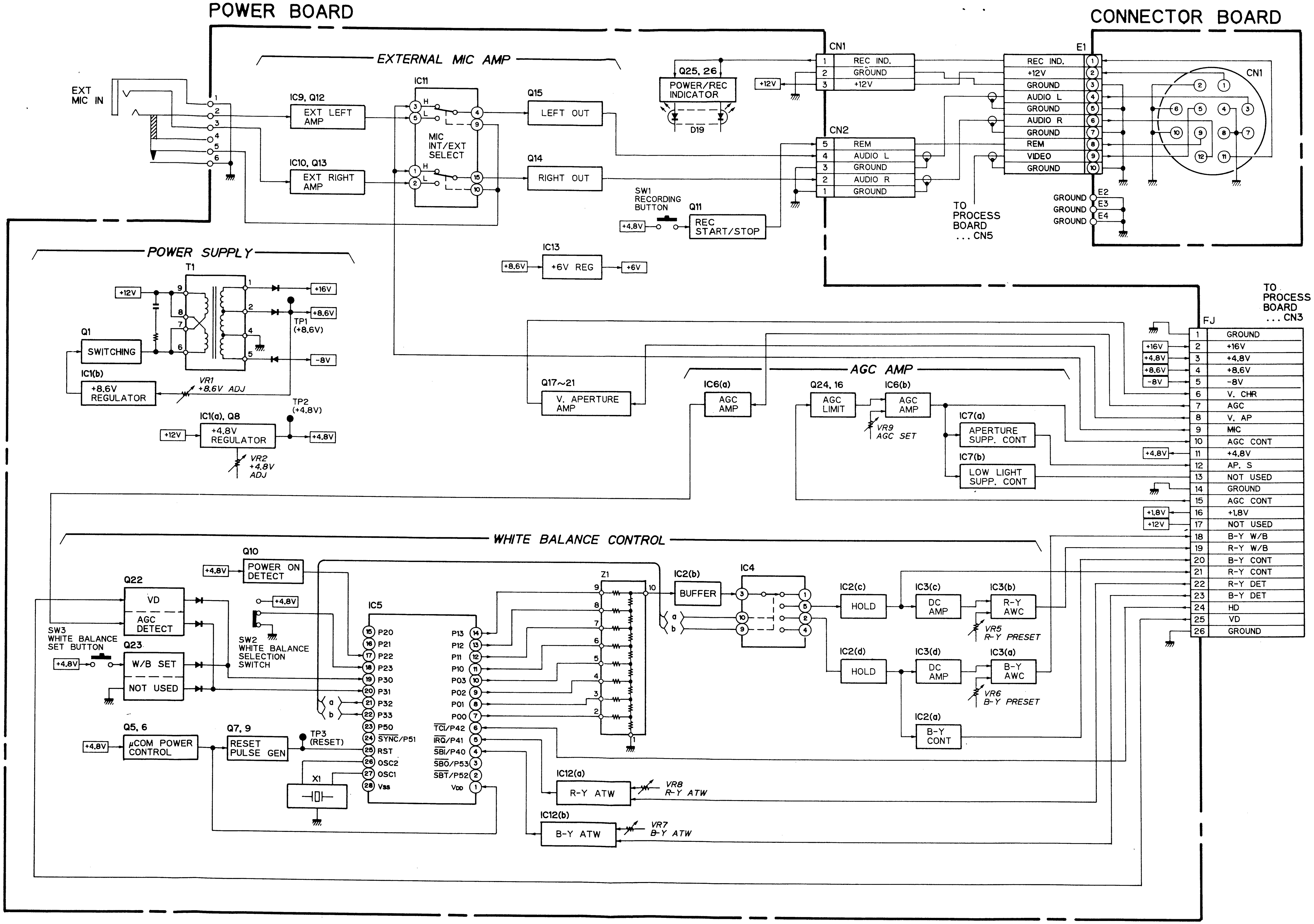
LN086WP38



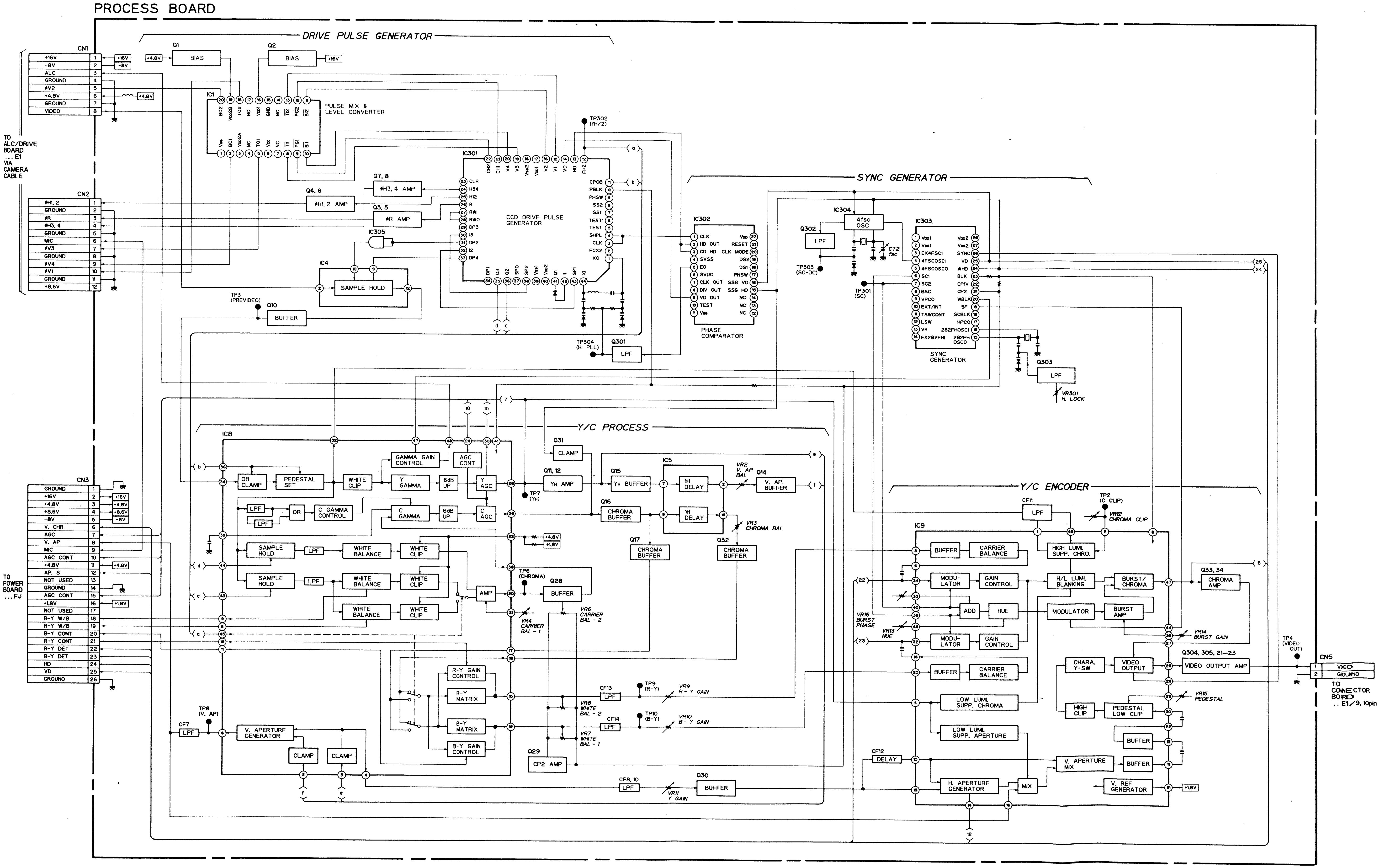
BLOCK DIAGRAM OF SENSOR, MIC, ALC, DRIVE BOARD


MIC BOARD
ALC BOARD
ALC DRIVE
DAMPER COIL
IRIS MOTOR
M
DRIVE COIL
CN1
DAMPER (−) 1
DAMPER (+) 2
DRIVE (+) 3
DRIVE (−) 4
a
b
c
E2
CN2
① DAMPER (+) 1
② DAMPER (−) 2
③ DAMPER (−) 3
④ DRIVE (+) 4
⑤ +4.8V 5
⑥ GROUND 6
⑦ DAMPER CONT 7
+4.8V
IC3(a)
DAMPER
IC3(b)
DRIVER
IC4
+1.8V REG.
VR1
ALC
SENSOR BOARD
CN1
CN1
1 +16V(1) 1
2 +16V 2
3 −8V 3
4 VIDEO 4
5 ϕV2 5
6 ϕV1 6
+16V
−8V
IC1
① ϕR
② RD
③ OD
④ VO
⑤ LG
⑥ OG
⑦ NC
⑧ ϕH2
⑨ ϕH1
⑩ NC
PW ⑳
VS ⑲
ϕV4 ⑱
ϕV3 ⑰
ϕV2 ⑯
ϕV1 ⑮
Sub ⑭
PT ⑬
HS ⑫
TG ⑪
Q2
CCD OUT BUFFER
E1
① −8V
② +16V
③ VIDEO
④ GROUND
⑤ ϕV2
⑥ GROUND
⑦ GROUND
⑧ ALC
⑨ +4.8V
⑩ GROUND
⑪ ϕV1
⑫ GROUND
⑬ GROUND
+4.8V
CN1
+16V 1
−8V 2
ALC 3
GROUND 4
ϕV2 5
+4.8V 6
GROUND 7
VIDEO 8
TO PROCESS BOARD ... CN1
DRIVE BOARD
CN2
CN1
10 V Sub 10
9 ϕV3 9
8 ϕH3, 4 8
7 +16V(1) 7
6 ϕV4 6
5 ϕH1, 2 5
4 GROUND 4
3 ϕR 3
2 GROUND 2
1 GROUND 1
VR2
CCD BIAS
E1
① ϕH1, 2
② GROUND
③ GROUND
④ ϕR
⑤ ϕH3, 4
⑥ GROUND
⑦ GROUND
⑧ MIC
⑨ +8.6V
⑩ ϕV4
⑪ GROUND
⑫ GROUND
⑬ ϕV3
CN2
ϕH1, 2 1
GROUND 2
ϕR 3
ϕH1, 2 4
GROUND 5
MIC 6
ϕV3 7
GROUND 8
ϕV4 9
ϕV1 10
GROUND 11
+8.6V 12
TO PROCESS BOARD ... CN2
E3
CN2
① GROUND 1
② DAMPER CONT 2
③ DAMPER (−) 3
④ +4.8V 4
⑤ +6V 5
⑥ MIC 6
+6V
c
a
b
Q10, 11
DAMPER CONTROL
IC5
+6V REG.
MIC
CN2
MIC 2
GROUND 1
IC2, Q1
MIC AMP.

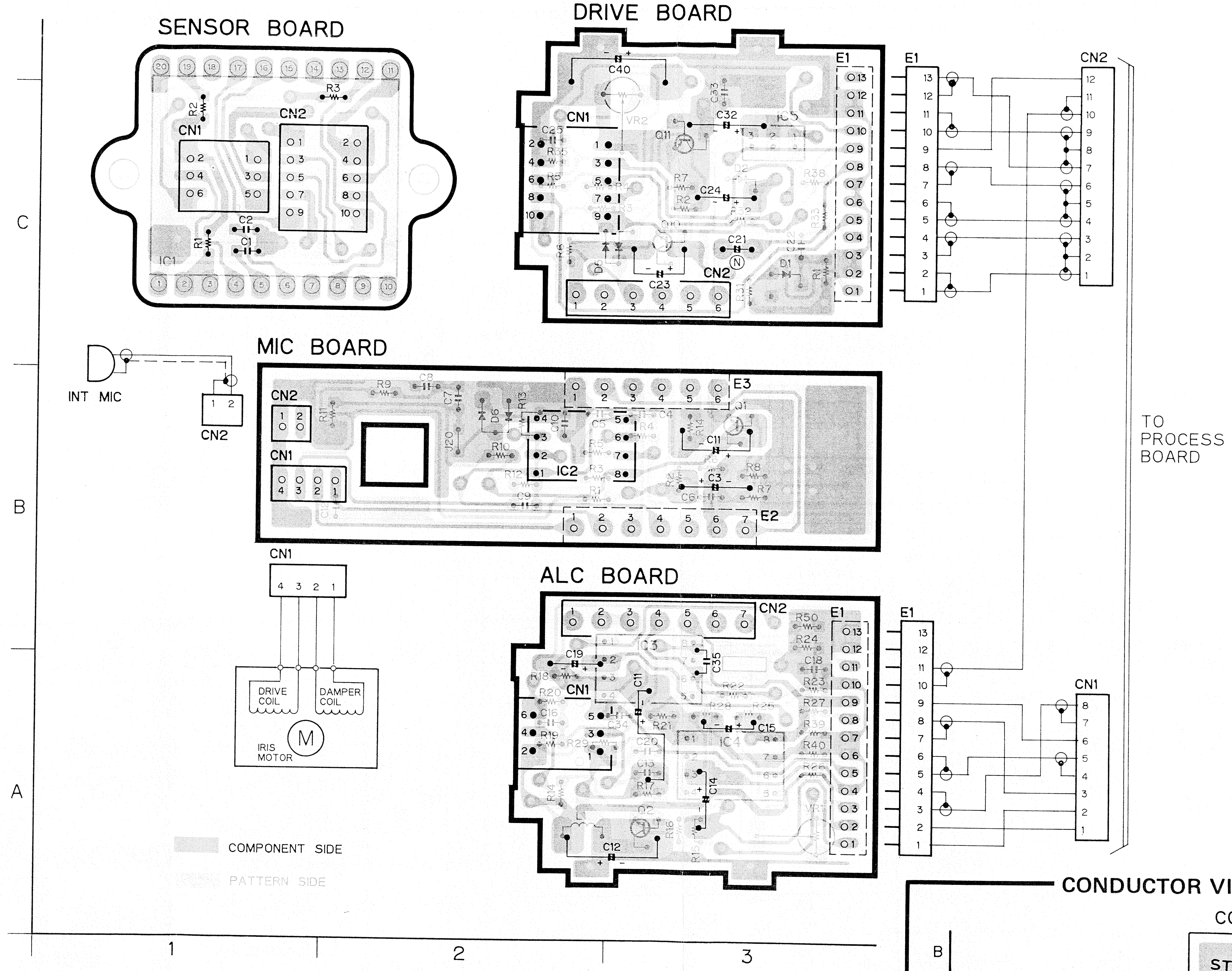
BLOCK DIAGRAM OF POWER BOARD


POWER BOARD
CONNECTOR BOARD
EXT MIC IN
EXTERNAL MIC AMP
IC9, Q12
EXT LEFT AMP
IC10, Q13
EXT RIGHT AMP
IC11
MIC INT/EXT SELECT
H
L
Q15
LEFT OUT
Q14
RIGHT OUT
Q25, 26
POWER/REC INDICATOR
D19
+12V
CN1
REC IND.
GROUND
+12V
CN2
REM
AUDIO L
GROUND
AUDIO R
GROUND
SW1
RECORDING BUTTON
Q11
REC START/STOP
+4.8V
IC13
+8.6V
+6V REG
+6V
E1
REC IND.
+12V
GROUND
AUDIO L
GROUND
AUDIO R
GROUND
REM
VIDEO
GROUND
CN1
TO PROCESS BOARD ... CN5
GROUND
GROUND
GROUND
E2
E3
E4
POWER SUPPLY
T1
+12V
+16V
+8.6V
TP1 (+8.6V)
-8V
Q1
SWITCHING
IC1(b)
+8.6V REGULATOR
VR1 +8.6V ADJ
TP2 (+4.8V)
IC1(a), Q8
+4.8V REGULATOR
VR2 +4.8V ADJ
Q17~21
V. APERTURE AMP
AGC AMP
IC6(a)
AGC AMP
Q24, 16
AGC LIMIT
IC6(b)
AGC AMP
VR9 AGC SET
IC7(a)
APERTURE SUPP. CONT
IC7(b)
LOW LIGHT SUPP. CONT
TO PROCESS BOARD ... CN3
FJ
1 GROUND
2 +16V
3 +4.8V
4 +8.6V
5 -8V
6 V. CHR
7 AGC
8 V. AP
9 MIC
10 AGC CONT
11 +4.8V
12 AP. S
13 NOT USED
14 GROUND
15 AGC CONT
16 +1.8V
17 NOT USED
18 B-Y W/B
19 R-Y W/B
20 B-Y CONT
21 R-Y CONT
22 R-Y DET
23 B-Y DET
24 HD
25 VD
26 GROUND
+16V
+4.8V
+8.6V
-8V
+1.8V
+12V
WHITE BALANCE CONTROL
Q10
POWER ON DETECT
Q22
VD
AGC DETECT
SW3
WHITE BALANCE SET BUTTON
Q23
W/B SET
NOT USED
SW2
WHITE BALANCE SELECTION SWITCH
IC5
P20
P21
P22
P23
P30
P31
P32
P33
P50
SYNC/P51
RST
OSC2
OSC1
Vss
P13
P12
P11
P10
P03
P02
P01
P00
TCI/P42
IRQ/P41
SBI/P40
SBO/P53
SBT/P52
VDD
Q5, 6
μCOM POWER CONTROL
Q7, 9
RESET PULSE GEN
TP3 (RESET)
X1
Z1
IC2(b)
BUFFER
IC4
IC2(c)
HOLD
IC3(c)
DC AMP
IC3(b)
R-Y AWC
VR5 R-Y PRESET
IC2(d)
HOLD
IC3(d)
DC AMP
IC3(a)
B-Y AWC
VR6 B-Y PRESET
IC2(a)
B-Y CONT
IC12(a)
R-Y ATW
VR8 R-Y ATW
IC12(b)
B-Y ATW
VR7 B-Y ATW

BLOCK DIAGRAM OF PROCESS BOARD


PROCESS BOARD
DRIVE PULSE GENERATOR
CN1
+16V
-8V
ALC
GROUND
ϕV2
+4.8V
GROUND
VIDEO
TO ALC/DRIVE BOARD ...E1 VIA CAMERA CABLE
Q1
BIAS
Q2
BIAS
IC1
PULSE MIX & LEVEL CONVERTER
TP302 (fH/2)
IC301
CCD DRIVE PULSE GENERATOR
CN2
ϕH1, 2
ϕR
ϕH3, 4
MIC
ϕV3
ϕV4
ϕV1
+8.6V
Q7, 8
ϕH3, 4 AMP
Q4, 6
ϕH1, 2 AMP
Q3, 5
ϕR AMP
IC305
IC4
SAMPLE HOLD
TP3 (PREVIDEO)
Q10
BUFFER
TP304 (H. PLL)
Q301
LPF
IC302
PHASE COMPARATOR
SYNC GENERATOR
IC304
4fsc OSC
Q302
LPF
CT2 fsc
TP303 (SC-DC)
TP301 (SC)
IC303
SYNC GENERATOR
Q303
LPF
VR301 H. LOCK
Y/C PROCESS
IC8
OB CLAMP
PEDESTAL SET
WHITE CLIP
GAMMA GAIN CONTROL
Y GAMMA
6dB UP
AGC CONT
Y AGC
C GAMMA CONTROL
C GAMMA
C AGC
OR
LPF
SAMPLE HOLD
WHITE BALANCE
WHITE CLIP
AMP
TP6 (CHROMA)
Q28
BUFFER
TP7 (YH)
Q31
CLAMP
Q11, 12
YH AMP
Q15
YH BUFFER
IC5
1H DELAY
VR2 V. AP BAL
Q14
V. AP. BUFFER
Q16
CHROMA BUFFER
VR3 CHROMA BAL
Q17
CHROMA BUFFER
Q32
CHROMA BUFFER
VR4 CARRIER BAL - 1
VR6 CARRIER BAL - 2
R-Y GAIN CONTROL
R-Y MATRIX
B-Y MATRIX
B-Y GAIN CONTROL
TP8 (V. AP)
CF7
LPF
V. APERTURE GENERATOR
CLAMP
CF13
LPF
TP9 (R-Y)
VR9 R - Y GAIN
VR8 WHITE BAL - 2
CF14
TP10 (B-Y)
VR10 B - Y GAIN
VR7 WHITE BAL - 1
Q29
CP2 AMP
CF8, 10
VR11 Y GAIN
Q30
CN3
V. CHR
AGC
V. AP
AGC CONT
AP. S
NOT USED
+1.8V
B-Y W/B
R-Y W/B
B-Y CONT
R-Y CONT
R-Y DET
B-Y DET
HD
VD
TO POWER BOARD ...FJ
Y/C ENCODER
CF11
TP2 (C CLIP)
VR12 CHROMA CLIP
IC9
CARRIER BALANCE
HIGH LUMI. SUPP. CHRO.
MODU-LATOR
GAIN CONTROL
H/L LUMI. BLANKING
BURST/CHROMA
ADD
HUE
MODULATOR
BURST AMP
Q33, 34
CHROMA AMP
VR16 BURST PHASE
VR13 HUE
VR14 BURST GAIN
CHARA. Y-SW
VIDEO OUTPUT
Q304, 305, 21~23
VIDEO OUTPUT AMP
TP4 (VIDEO OUT)
CN5
VIDEO
GROUND
TO CONNECTOR BOARD ...E1/9, 10pin
LOW LUMI. SUPP. CHROMA
HIGH CLIP
PEDESTAL LOW CLIP
VR15 PEDESTAL
LOW LUMI. SUPP. APERTURE
CF12
DELAY
V. APERTURE MIX
H. APERTURE GENERATOR
MIX
V. REF GENERATOR

CONDUCTOR VIEW OF SENSOR, MIC, ALC, DRIVE BOARD


SENSOR BOARD
DRIVE BOARD
MIC BOARD
ALC BOARD
INT MIC
CN1
CN2
E1
E2
E3
IC1
IC2
IC3
IC4
IC5
DRIVE COIL
DAMPER COIL
IRIS MOTOR
M
TO PROCESS BOARD
COMPONENT SIDE
PATTERN SIDE
A
B
C
1
2
3

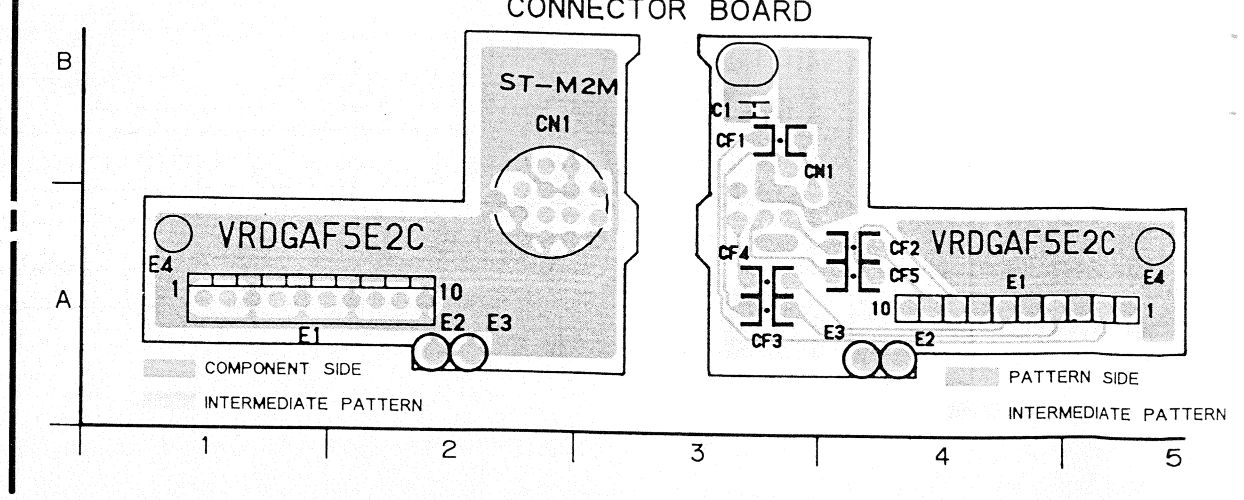
SENSOR BOARD	
IC1	C1

MIC BOARD	
IC2	B2
Q1	B3
D6	B2

ALC BOARD	
IC3	A3
IC4	A3
Q2	A3

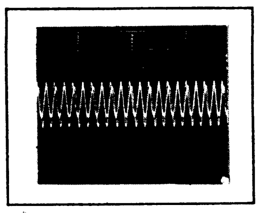
DRIVE BOARD	
IC5	C3
Q10	C3
Q11	C3
D1	C3
D2	C3
D5	C3

CONDUCTOR VIEW OF CONNECTOR BOARD

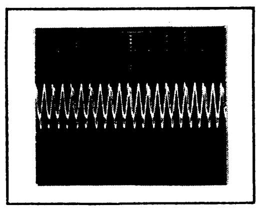

CONNECTOR BOARD
ST-M2M
CN1
VRDGAF5E2C
E1
E2
E3
E4
C1
CF1
CF2
CF3
CF4
CF5
COMPONENT SIDE
INTERMEDIATE PATTERN
PATTERN SIDE
A
B
1
2
3
4
5

SCHEMATIC DIAGRAM OF SENSOR, MIC, ALC,

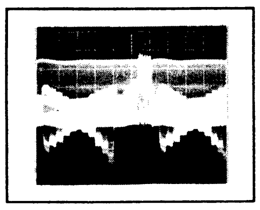
1. 0.1μsec/DIV, 0.1V/DIV



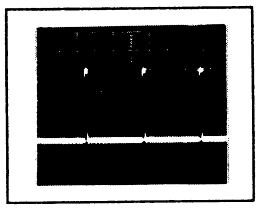
2. 0.1μsec/DIV, 0.1V/DIV



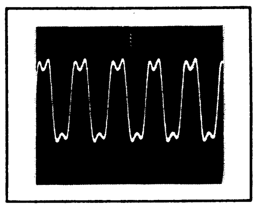
3. 10μsec/DIV, 0.1V/DIV



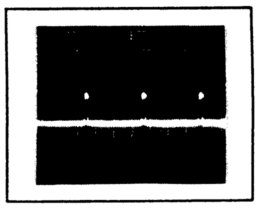
4. 20μsec/DIV, 2V/DIV



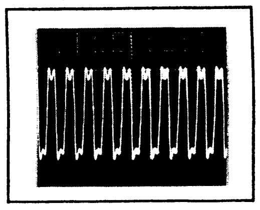
5. 50μsec/DIV, 2V/DIV



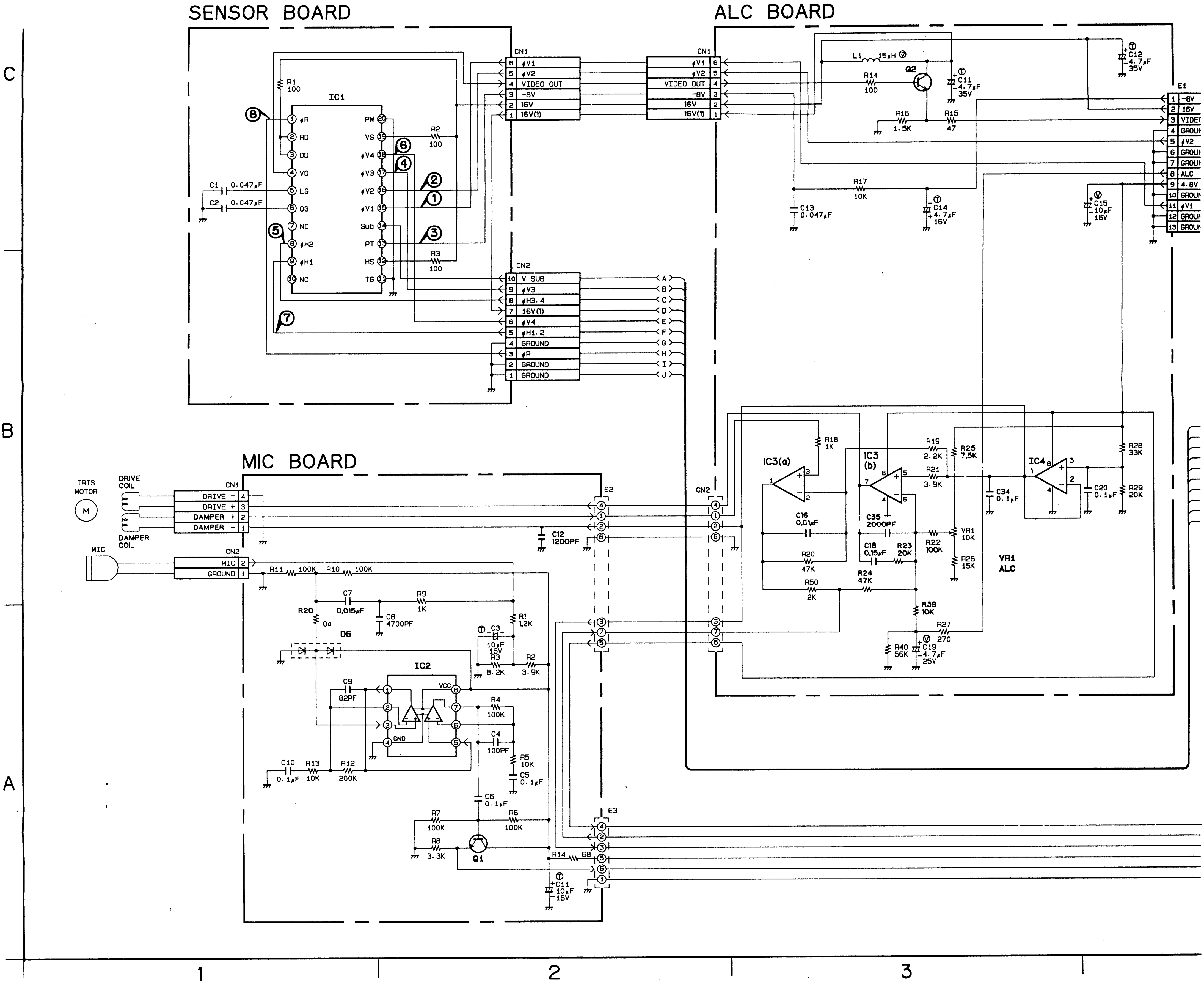
6. 20μsec/DIV, 0.1V/DIV



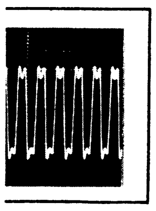
7. 0.1μsec/DIV, 2V/DIV

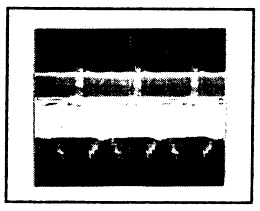


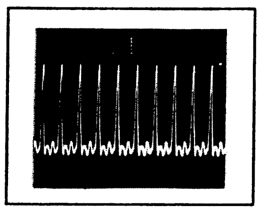
8. 20μs



MIC, ALC, DRIVE BOARD


'DIV, 2V/DIV


8. 20µsec/DIV, 0.1V/DIV


9. 0.1µsec/DIV, 2V/DIV

SENSOR BOARD

IC1	C1

ALC BOARD

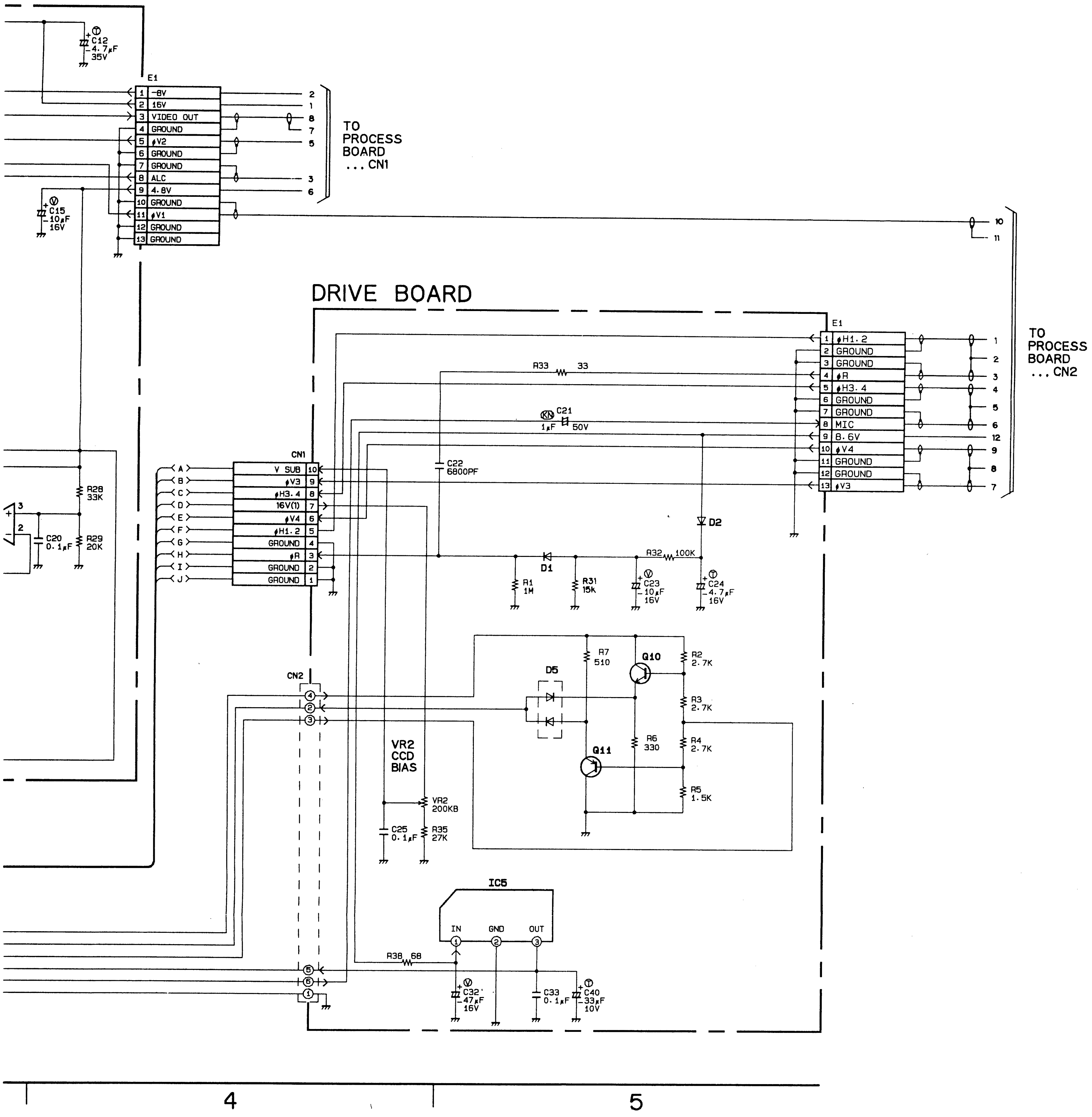
IC3	B3
IC4	B3
Q2	C3

MIC BOARD

IC2	A2
Q1	A2
D6	A1

DRIVE BOARD

IC5	A5
Q10	B5
Q11	A5
D1	B5
D2	B5
D5	A5


C12
4.7µF
35V
E1
1 -8V
2 16V
3 VIDEO OUT
4 GROUND
5 ϕV2
6 GROUND
7 GROUND
8 ALC
9 4.8V
10 GROUND
11 ϕV1
12 GROUND
13 GROUND
2
1
8
7
5
3
6
TO PROCESS BOARD ... CN1
C15
10µF
16V
10
11
DRIVE BOARD
E1
1 ϕH1.2
2 GROUND
3 GROUND
4 ϕR
5 ϕH3.4
6 GROUND
7 GROUND
8 MIC
9 8.6V
10 ϕV4
11 GROUND
12 GROUND
13 ϕV3
1
2
3
4
5
6
12
9
8
7
TO PROCESS BOARD ... CN2
R33 33
C21
1µF 50V
C22
6800PF
CN1
V SUB 10
ϕV3 9
ϕH3.4 8
16V(1) 7
ϕV4 6
ϕH1.2 5
GROUND 4
ϕR 3
GROUND 2
GROUND 1
A
B
C
D
E
F
G
H
I
J
R28
33K
R29
20K
C20
0.1µF
3
2
D2
D1
R32 100K
R1
1M
R31
15K
C23
10µF
16V
C24
4.7µF
16V
R7
510
Q10
R2
2.7K
D5
R3
2.7K
CN2
4
2
3
R6
330
R4
2.7K
Q11
VR2
CCD
BIAS
R5
1.5K
VR2
200KB
C25
0.1µF
R35
27K
IC5
IN
GND
OUT
1
2
3
R38 68
5
6
1
C32
47µF
16V
C33
0.1µF
C40
33µF
10V
4
5

MIC BOARD

	IC3	IC4
Pin 1	1.8	1.8
2	1.8	1.8
3	1.8	1.8
4	0	0
5	1.8	0.8
6	1.8	0.7
7	3.9	0
8	4.6	4.6

	Q2
B	8.8
C	15.8
E	0

ALC BOARD

	IC2
Pin 1	2.8
2	2.8
3	2.8
4	0
5	2.8
6	2.8
7	2.8
8	5.7

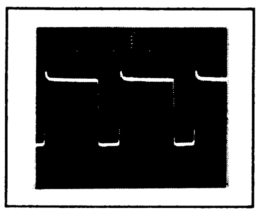
	Q1
B	2.7
C	5.8
E	0

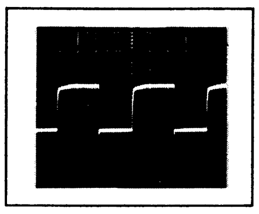
DRIVE BOARD

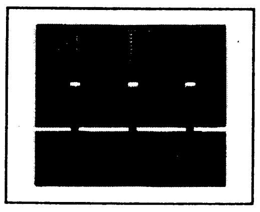
	IC5
Pin 1	0
2	0
3	6.1

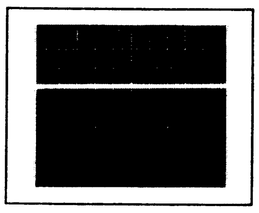
	Q10	Q11
B	3.2	0.7
C	4.7	0
E	2.5	1.4

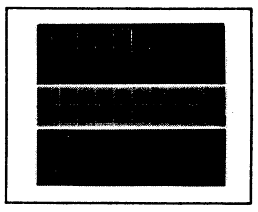
SCHEMATIC DIAGRAM OF PO

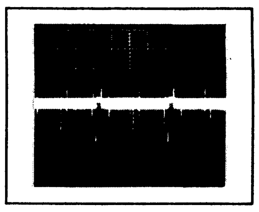

1. 2μsec/DIV, 5V/DIV

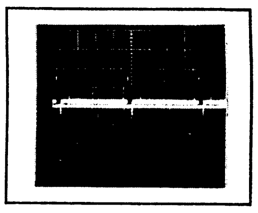

2. 2μsec/DIV, 5V/DIV

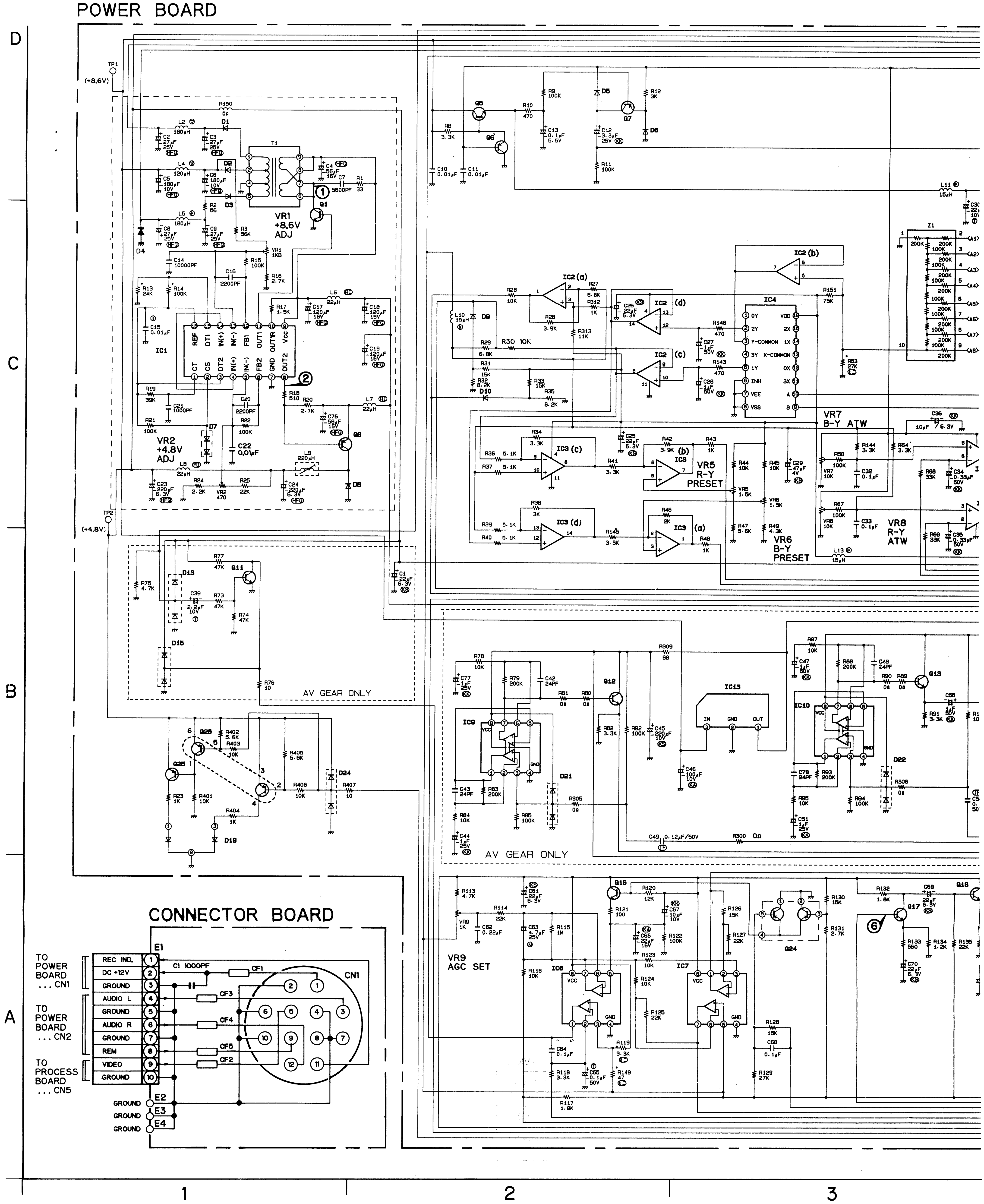

3. 20μsec/DIV, 2V/DIV


4. 5msec/DIV, 2V/DIV


5. 20μsec/DIV, 2V/DIV

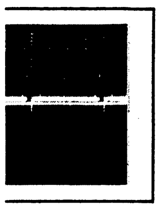

6. 5msec/DIV, 0.1V/DIV

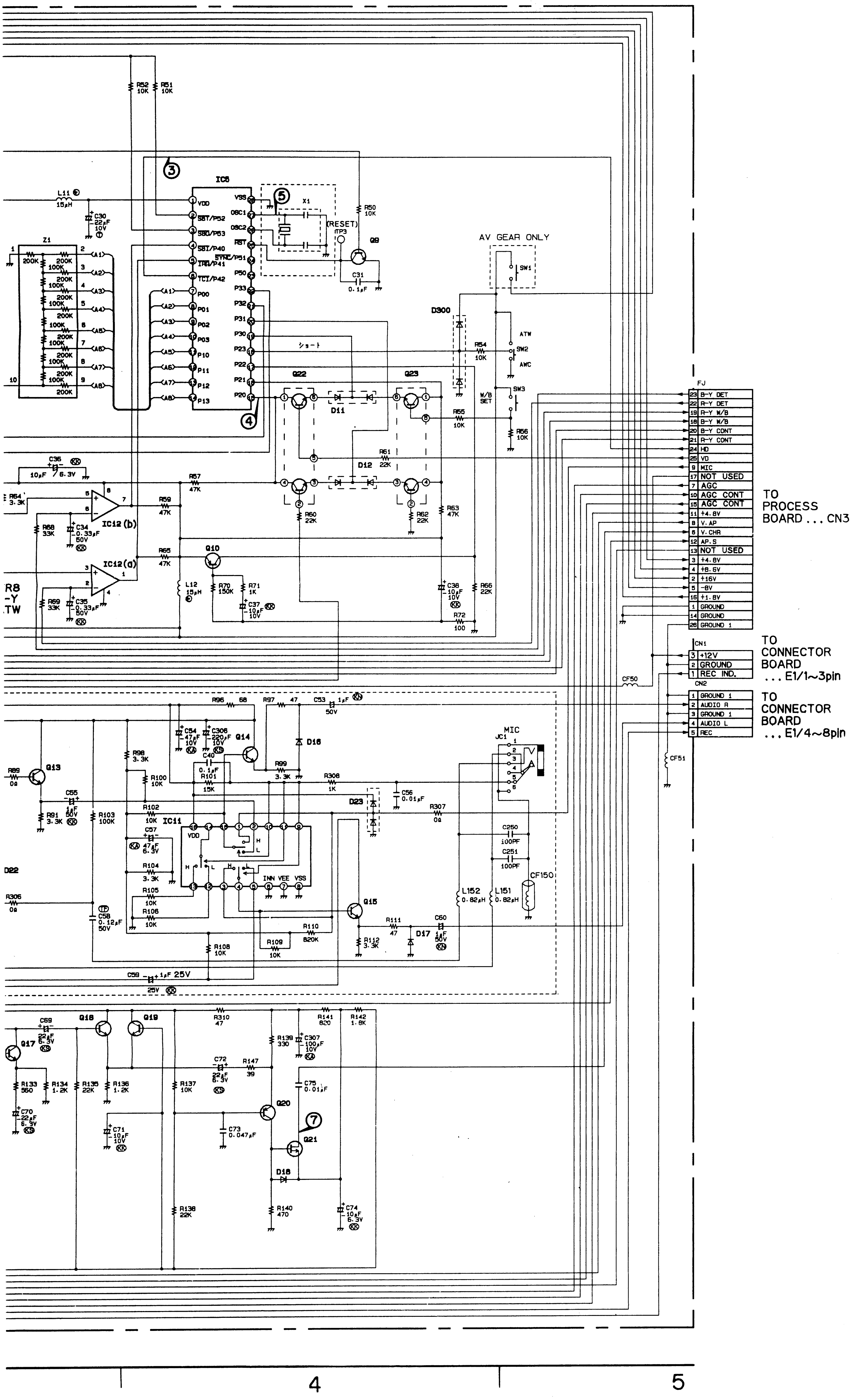

7. 5msec/DIV, 0.5V/DIV


POWER BOARD
D
C
B
A
1
2
3
TP1
(+8.6V)
TP2
(+4.8V)
R150 0Ω
L2 180μH
D1
C2 27μF 25V
C3 27μF 25V
T1
L4 120μH
D2
C5 180μF 10V
C6 180μF 10V
D3
C4 56μF 16V
C7 5600PF
R1 33
R2 56
L5 180μH
C8 27μF 25V
C9 27μF 25V
R3 56K
VR1 +8.6V ADJ
Q1
D4
C14 10000PF
C16 2200PF
R15 100K
VR1 1KB
R16 2.7K
R13 24K
R14 100K
R17 1.5K
C17 120μF 16V
L6 22μH
C18 120μF 16V
C15 0.01μF
IC1
REF
DT1
IN(+)
IN(-)
FB1
OUT1
OUT1R
Vcc
CT
CS
DT2
IN(+)
IN(-)
FB2
GND
OUT2
C19 120μF 16V
R19 39K
C21 1000PF
C20 2200PF
R18 510
R20 2.7K
L7 22μH
C76 56μF 16V
R21 100K
R22 100K
D7
VR2 +4.8V ADJ
C22 0.01μF
Q8
L9 220μH
L8 22μH
C23 220μF 6.3V
R24 2.2K
VR2 470
R25 22K
C24 220μF 6.3V
D8
C1 22μF 6.3V
R77 47K
Q11
D13
R75 4.7K
C39 2.2μF 10V
R73 47K
R74 47K
D15
R76 10
AV GEAR ONLY
Q26
R402 5.6K
R403 10K
R405 5.6K
Q25
D24
R406 10K
R407 10
R23 1K
R401 10K
R404 1K
D19
Q5
R10 470
R9 100K
D5
R12 3K
Q7
D6
R8 3.3K
Q6
C13 0.1μF 5.5V
C12 3.3μF 25V
C10 0.01μF
C11 0.01μF
R11 100K
L11 15μH
Z1
200K
100K
L10 15μH
D9
IC2(a)
R26 10K
R27 6.8K
R312 1K
R28 3.9K
R313 11K
C26 22μF 6.3V
IC2(d)
IC2(b)
R151 75K
IC4
0Y
2Y
Y-COMMON
3Y
X-COMMON
1Y
INH
VEE
VSS
VDD
2X
1X
0X
3X
A
B
R146 470
C27 1μF 50V
R143 470
C28 1μF 50V
IC2(c)
R29 6.8K
R30 10K
R31 15K
R32 8.2K
D10
R33 15K
R35 8.2K
R53 27K
VR7 B-Y ATW
C36 10μF 6.3V
R34 3.3K
IC3(c)
C25 22μF 6.3V
R42 3.9K
R43 1K
IC3(b)
R36 5.1K
R37 5.1K
R41 3.3K
VR5 R-Y PRESET
R44 10K
R45 10K
C29 47μF 4V
VR5 1.5K
R58 100K
R144 3.3K
R64 3.3K
VR7 10K
C32 0.1μF
R68 33K
C34 0.33μF 50V
R38 3K
IC3(d)
R46 2K
IC3(a)
VR6 1.5K
R67 100K
R39 5.1K
R40 5.1K
R145 3.3K
R48 1K
R47 5.6K
R49 4.3K
VR6 B-Y PRESET
VR8 10K
C33 0.1μF
VR8 R-Y ATW
R69 33K
C35 0.33μF 50V
L13 15μH
R309 68
R87 10K
R78 10K
C77 1μF 25V
R79 200K
C42 24PF
Q12
C47 1μF 50V
R88 200K
C48 24PF
Q13
R90 0Ω
R89 0Ω
R81 0Ω
R80 0Ω
IC13
IN
GND
OUT
IC10
R91 3.3K
C55 1μF 50V
IC9
VCC
GND
R82 3.3K
R92 100K
C45 220μF 10V
C46 100μF 10V
D22
R306 0Ω
D21
C43 24PF
R83 200K
R305 0Ω
C78 24PF
R93 200K
R95 10K
R94 100K
R84 10K
R85 100K
C51 1μF 25V
C44 1μF 25V
C49 0.12μF/50V
R300 0Ω
AV GEAR ONLY
Q16
R120 12K
R130 15K
R132 1.8K
C69 22μF 6.3V
Q18
R113 4.7K
C61 22μF 6.3V
R121 100
C67 10μF 10V
R126 15K
Q17
R114 22K
VR9 1K
C62 0.22μF
C63 4.7μF 25V
R115 1M
C66 22μF 16V
R122 100K
R127 22K
Q24
R131 2.7K
R133 560
R134 1.2K
R135 22K
VR9 AGC SET
R116 10K
IC6
R123 10K
IC7
C70 22μF 6.3V
R124 10K
R125 22K
R128 15K
C68 0.1μF
C64 0.1μF
R119 3.3K
R118 3.3K
C65 0.1μF 50V
R149 47
R129 27K
R117 1.8K
CONNECTOR BOARD
E1
TO POWER BOARD ...CN1
TO POWER BOARD ...CN2
TO PROCESS BOARD ...CN5
REC IND.
DC +12V
GROUND
AUDIO L
GROUND
AUDIO R
GROUND
REM
VIDEO
GROUND
C1 1000PF
CF1
CF3
CF4
CF5
CF2
CN1
E2
E3
E4
GROUND
GROUND
GROUND

OF POWER BOARD

IV, 0.5V/DIV





POWER BOARD

IC1	C1	Q21	A4
IC2	C2,C3	Q22	C4
IC3	C2	Q23	C4
IC4	C3	Q24	A3
IC5	C4	Q25	B1
IC6	A2	Q26	B1
IC7	A3	D1	D1
IC9	B2	D2	D1
IC10	B3	D3	D1
IC11	B4	D4	C1
IC12	C3	D5	D2
IC13	B3	D6	D2
Q1	C1	D7	C1
Q5	D2	D8	C1
Q6	D2	D9	C2
Q7	D2	D10	C2
Q8	C1	D11	C4
Q9	C4	D12	C4
Q10	C4	D13	B1
Q11	B1	D15	B1
Q12	B2	D16	B4
Q13	B3	D17	B4
Q14	B4	D18	A4
Q15	B4	D19	B1
Q16	A2	D21	B2
Q17	A3	D22	B3
Q18	A3	D23	B4
Q19	A4	D24	B1
Q20	A4	D300	C4

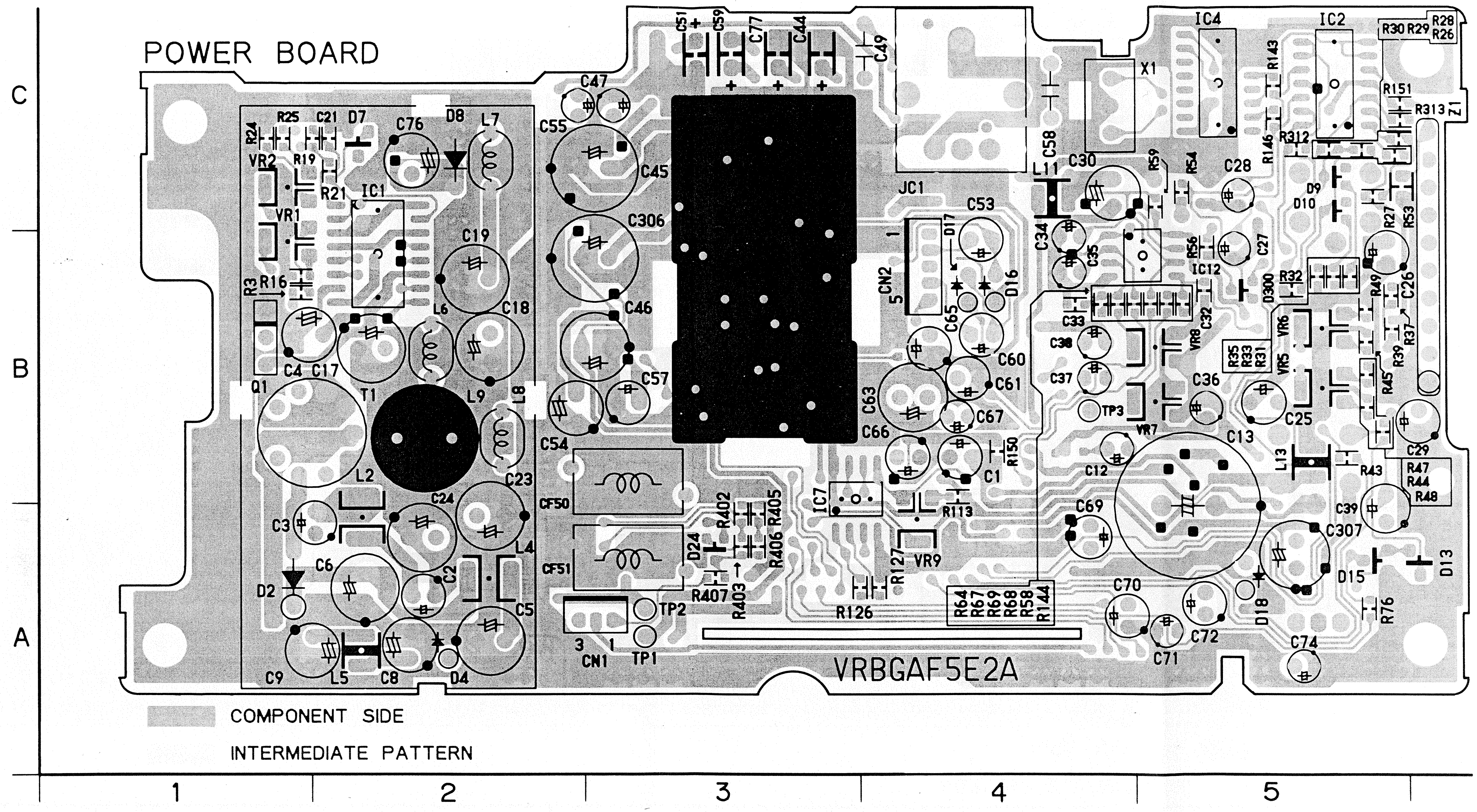
	IC1	IC2	IC3	IC4	IC5	IC6	IC7	IC9	IC10	IC11	IC12	IC13
Pin 1	0	1.8	1.7	0	4.8	0	2.1	2.9	2.9	2.8	0	6.1
2	0.8	1.8	1.6	0	1.6	1.8	0	2.9	2.9	2.8	1.7	0
3	2.5	1.8	1.6	1.5	1.6	1.7	1.2	2.9	2.8	2.8	1.7	8.6
4	0.5	4.8	4.8	0	–	0	0	0	0	2.8	0	
5	0.5	1.5	1.7	0	–	2.0	1.7	2.9	2.8	2.8	1.7	
6	1.0	1.5	1.7	0	0.8	2.0	1.7	2.9	2.8	0	0	
7	0	1.5	1.7	0	–	1.2	2.6	2.9	2.8	0	0	
8	6.4	0	1.7	0	–	4.7	4.7	5.7	5.7	0	0	
9	12.0	0	1.7	0	4.8					0		
10	0	1.6	1.7	0.1	0.1					6.1		
11	0.2	0	0	0	0.1					6.1		
12	0.9	1.5	0	0	0					0		
13	0	0	1.5	0	0					0		
14	0.5	0	1.4	0	4.7					0		
15	0.5			0	4.7					2.8		
16	2.5			0	4.7					6.1		
17					4.7							
18					4.7							
19					0.3							
20					4.7							
21					0							
22					0.1							
23					0							
24					1.6							
25					4.7							
26					2.3							
27					2.2							
28					0							

	B	C	E
Q1	0.2	12.0	0
5	5.4	8.6	4.8
6	4.8	0	5.4
7	4.7	4.3	4.8
8	12.0	5.2	11.4
9	0	4.7	0
10	4.1	4.7	4.8
11	0	4.8	0
12	2.9	5.7	2.3
13	2.9	5.7	2.3
14	2.8	5.7	2.2
15	2.8	5.7	2.2
16	2.5	4.7	2.0
17	1.7	3.1	1.0
18	1.7	4.7	1.1
19	1.7	4.7	1.1
20	3.7	0.3	4.4
21	3.7	0.3	3.5
25	4.1	4.7	4.8

	Q22	Q23	Q24	Q25
1	4.8	4.8	0	4.1
2	0	0	0	4.8
3	0	0	2.1	0
4	4.8	4.8	2.5	0
5	0.1	0	1.9	4.8
6	0	0		4.8

COMPONENT SIDE

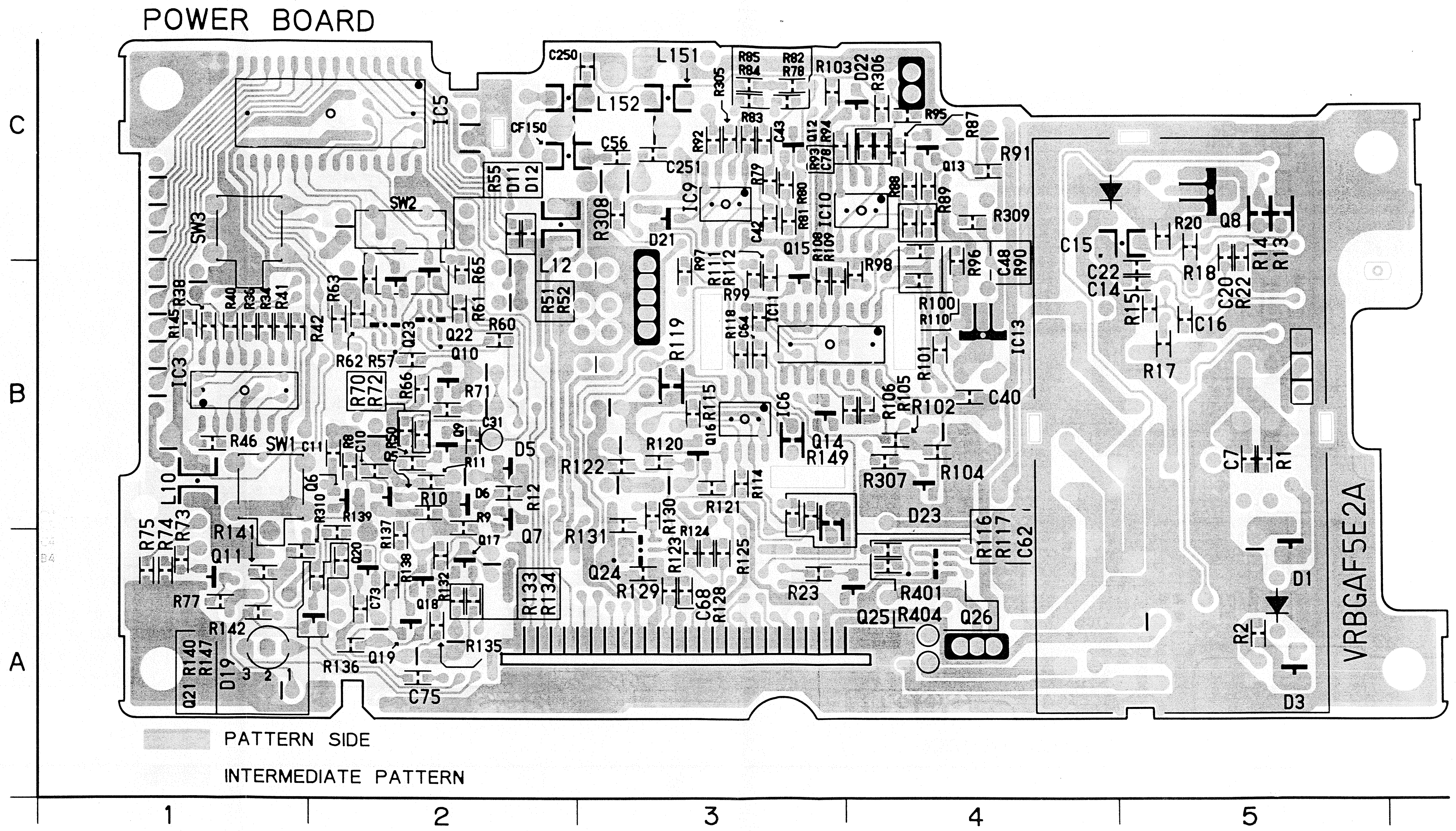
IC1	B2
IC2	C5
IC4	C5
IC7	B3
IC12	B5
Q1	B1
D2	A1
D4	A2
D7	C2
D8	C2
D9	C5
D10	C5
D13	A5
D15	A5
D16	B4
D17	B4
D18	A5
D24	A3
D300	B5


POWER BOARD
VRBGAF5E2A
C
B
A
1
2
3
4
5
R24 R25 C21 D7 D8 L7 C76
VR2 R19 R21 IC1 VR1
R3 R16 C19 C18 L6
C4 C17 Q1 T1 L9 L8
L2 C24 C23 C3 L4
C6 C2 D2 C5
C9 L5 C8 D4
C47 C55 C45 C306 C46 C57 C54
CF50 CF51 CN1 TP1 TP2 3 1
C51 C59 C77 C44 C49
D24 R402 R405 R406 R403 R407
IC7 R113 R127 VR9 R126
JC1 CN2 1 5 D17 C53 D16 C65 C60 C61 C63 C66 C67 C1 R150
C58 L11 C30 C34 C35 X1 R59 R54 C28 R56 C27 IC12 D300
C33 C38 C37 TP3 VR7 VR8 C32 C36 C12 C13 C69
R64 R67 R69 R68 R58 R144
C70 C71 C72 D18 C74
IC4 IC2 R143 R146 R312 R30 R29 R28 R26 R151 R313 Z1
D9 D10 R27 R53 R32 C26 R49 VR6 VR5 R35 R33 R31 R37 R39 R45
C25 C29 L13 R43 R47 R44 R48 C39 C307 D15 D13 R76

▨ COMPONENT SIDE

INTERMEDIATE PATTERN

VIEW OF POWER BOARD


POWER BOARD
C
B
A
1
2
3
4
5
VRBGAF5E2A
PATTERN SIDE
INTERMEDIATE PATTERN

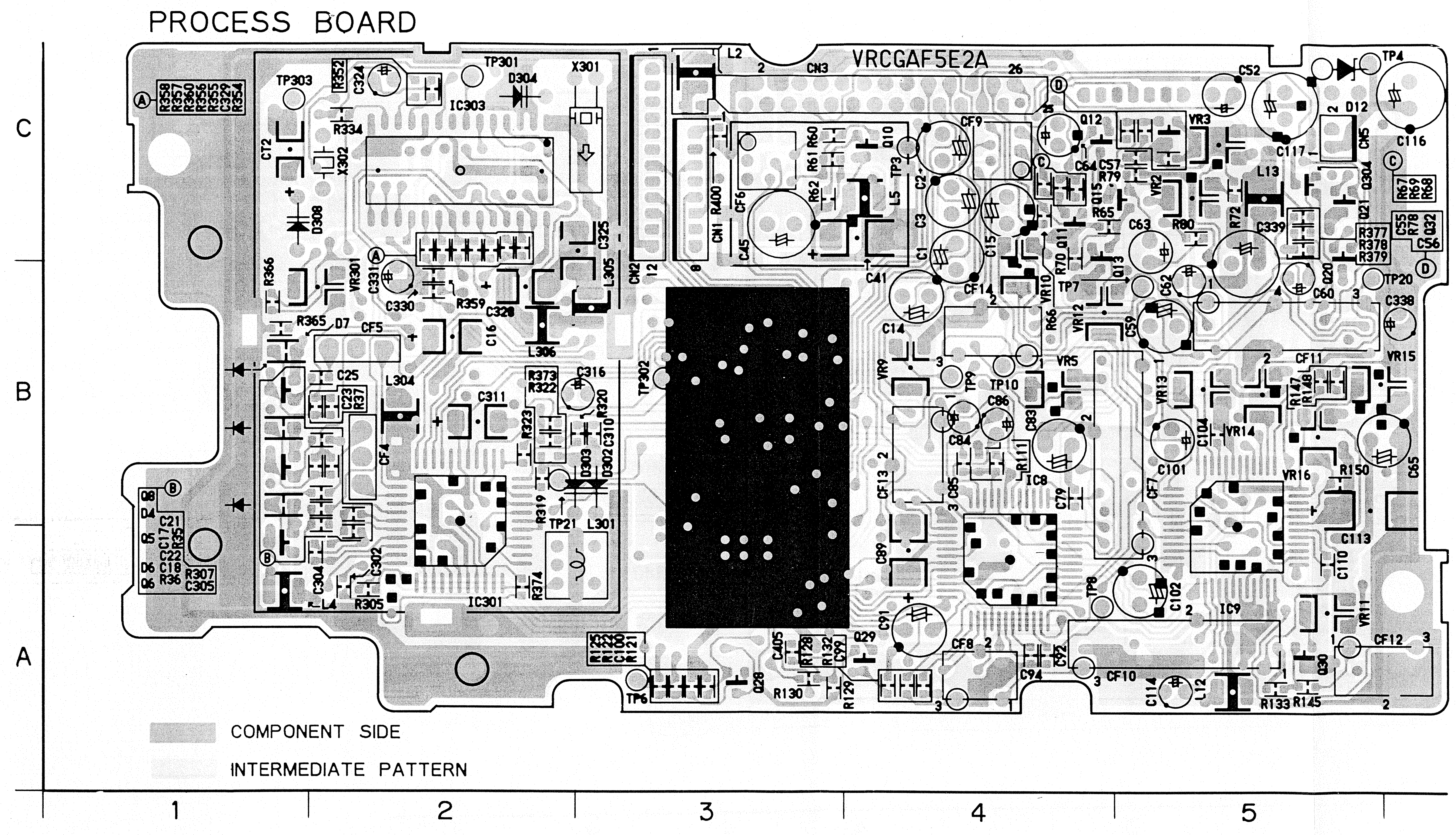
PATTERN SIDE

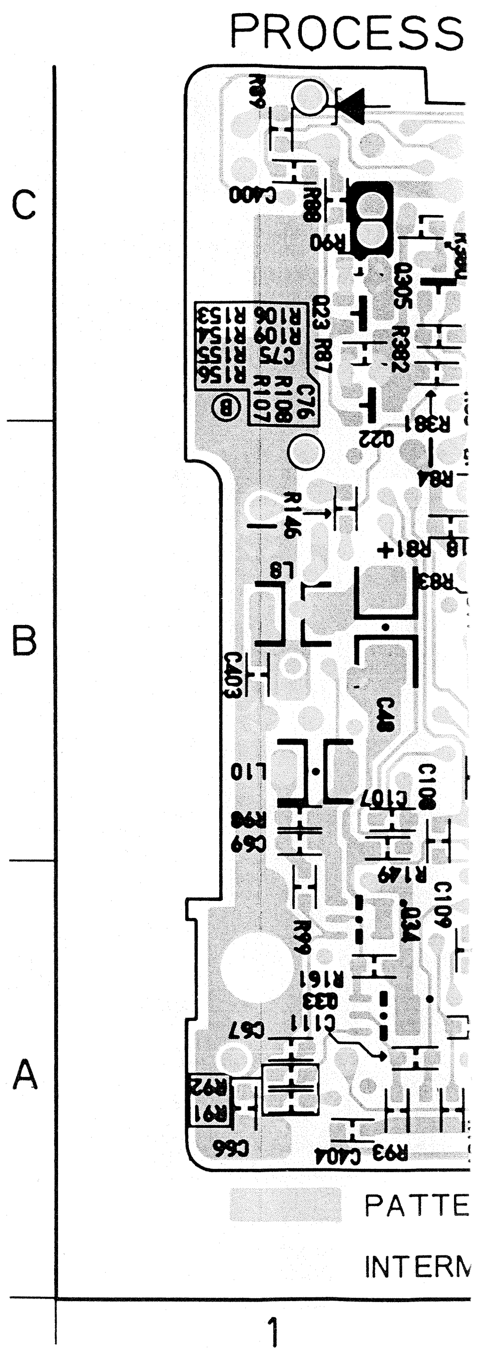
IC3	B1
IC5	C2
IC6	B3
IC9	C3
IC10	C4
IC11	B3
IC13	B4
Q5	B2
Q6	B2
Q7	B2
Q8	C5
Q9	B2
Q10	B2
Q11	A1
Q12	C3
Q13	C4
Q14	B3
Q15	B3
Q16	B3
Q17	A2
Q18	A2
Q19	A2
Q20	A2
Q21	A2
Q22	B2
Q23	B2
Q24	A3
Q25	A4
Q26	A4
D1	A5
D3	A5
D5	B2
D6	B2
D10	B2
D11	B2
D19	A1
D21	C3
D22	C4
D23	B4

CONDUCTOR VIEW OF PROCESS BOARD

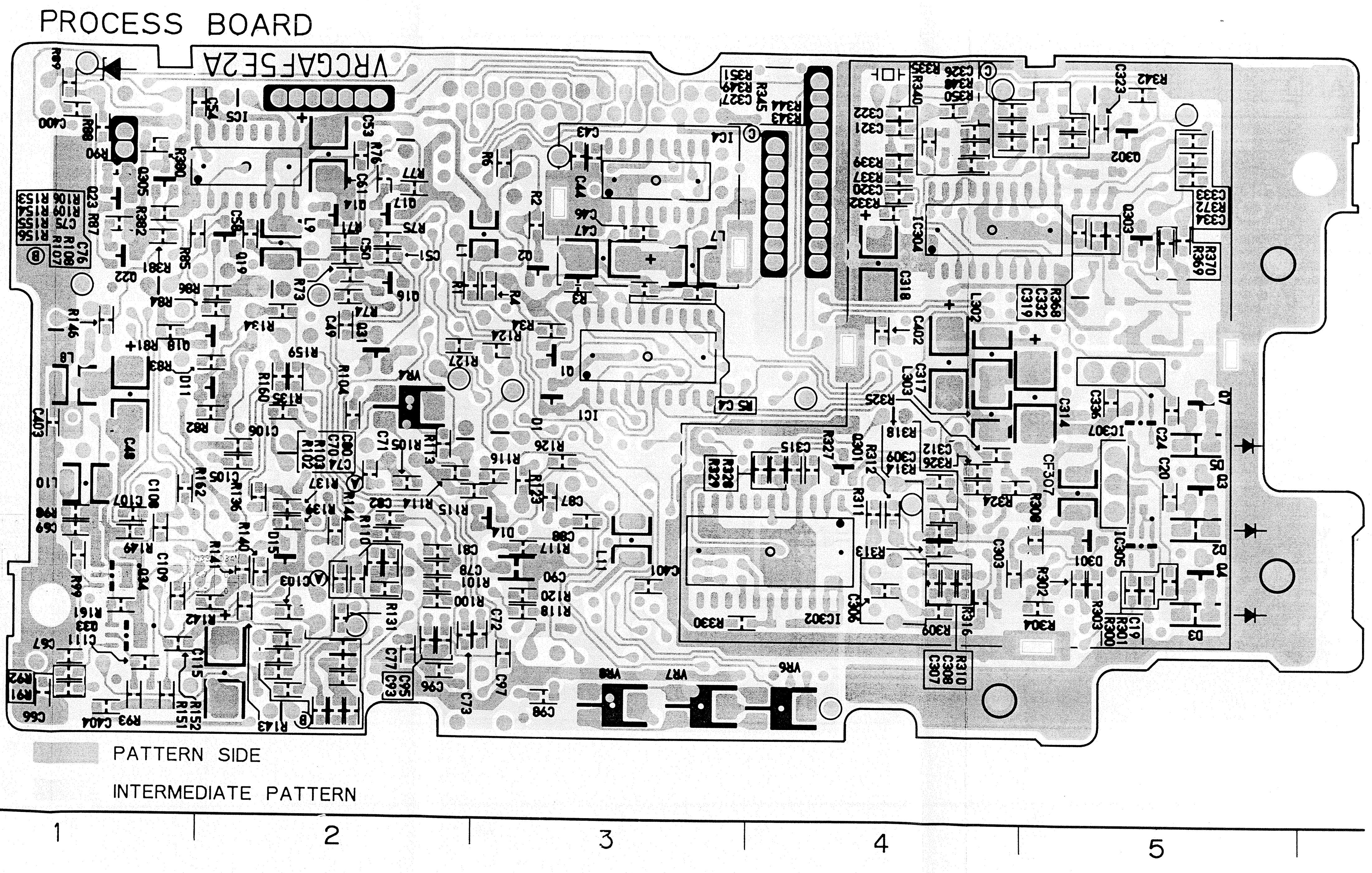
COMPONENT SIDE

IC8	A4
IC9	B5
IC301	B2
IC303	C2
Q5	B1
Q6	A1
Q8	B1
Q10	C4
Q11	C4
Q12	C4
Q13	C4
Q15	C5
Q20	C5
Q21	C5
Q28	A3
Q29	A4
Q30	A5
Q32	C5
Q304	C5
D4	B1
D6	B1
D7	B1
D12	C5
D302	B3
D303	B2
D304	C2
D308	C1


PROCESS BOARD
VRCGAF5E2A
C
B
A
1
2
3
4
5
IC8
IC9
IC301
IC303
TP301
TP303
TP302
TP21
TP4
TP6
TP20
X301
X302
CN1
CN2
CN3
COMPONENT SIDE
INTERMEDIATE PATTERN


PROCESS
C
B
A
1
PATTE
INTERM

ROCESS BOARD



PATTERN SIDE

IC1	B3
IC4	C3
IC5	C2
IC302	B4
IC304	C4
IC305	B5
IC307	B5
Q1	B3
Q2	C3
Q3	B5
Q4	A5
Q7	B5
Q14	C2
Q16	B2
Q17	C2
Q18	B2
Q19	C2
Q22	C1
Q23	C1
Q31	B2
Q33	A1
Q34	A1
Q301	B4
Q302	C5
Q303	C5
Q305	C1
D1	B3
D2	B5
D3	A5
D5	B5
D11	B2
D14	B3
D15	A2
D301	B5
D303	D3

Process Board

	IC1	IC4	IC5	IC302	IC303	IC304	IC305	IC307
Pin 1	-6.2	0	0	1.6	4.7	0	1.1	4.7
2	-5.9	6.5	2.4	0.5	0	0	1.1	10.9
3	1.0	0	0	0.5	0	2.3	0	0
4	-6.2	5.6	0	0	0.1	2.4	0	0
5	-5.7	0	0	2.0	0.1	0	4.6	4.7
6	4.8	0	0	4.8	2.3	3.4		
7	0	0	2.1	1.3	2.3	2.0		
8	4.4	4.7	2.0	1.1	4.8	2.0		
9	4.7	-4.1	2.3	0.1	0	0		
10	4.4	0	0	0	0	0		
11	0.2	0	2.1	0	0	4.7		
12	4.7	6.5	0	0	4.7	2.6		
13	0.1	8.5	0	0	4.8	2.6		
14	0	6.6	2.6	0	2.2	0.1		
15	0	0	0	0.7	0	0.7		
16	12.4	0	2.5	0.1	0	0		
17	-6.1			0	4.0	—		
18	0.8			0	0	—		
19	1.0			0	0	4.7		
20	0.6			0	0.3	4.7		
21				0	0.1			
22				4.8	1.2			
23					0.8			
24					0.1			
25					4.4			
26					4.7			
27					0			
28					0			

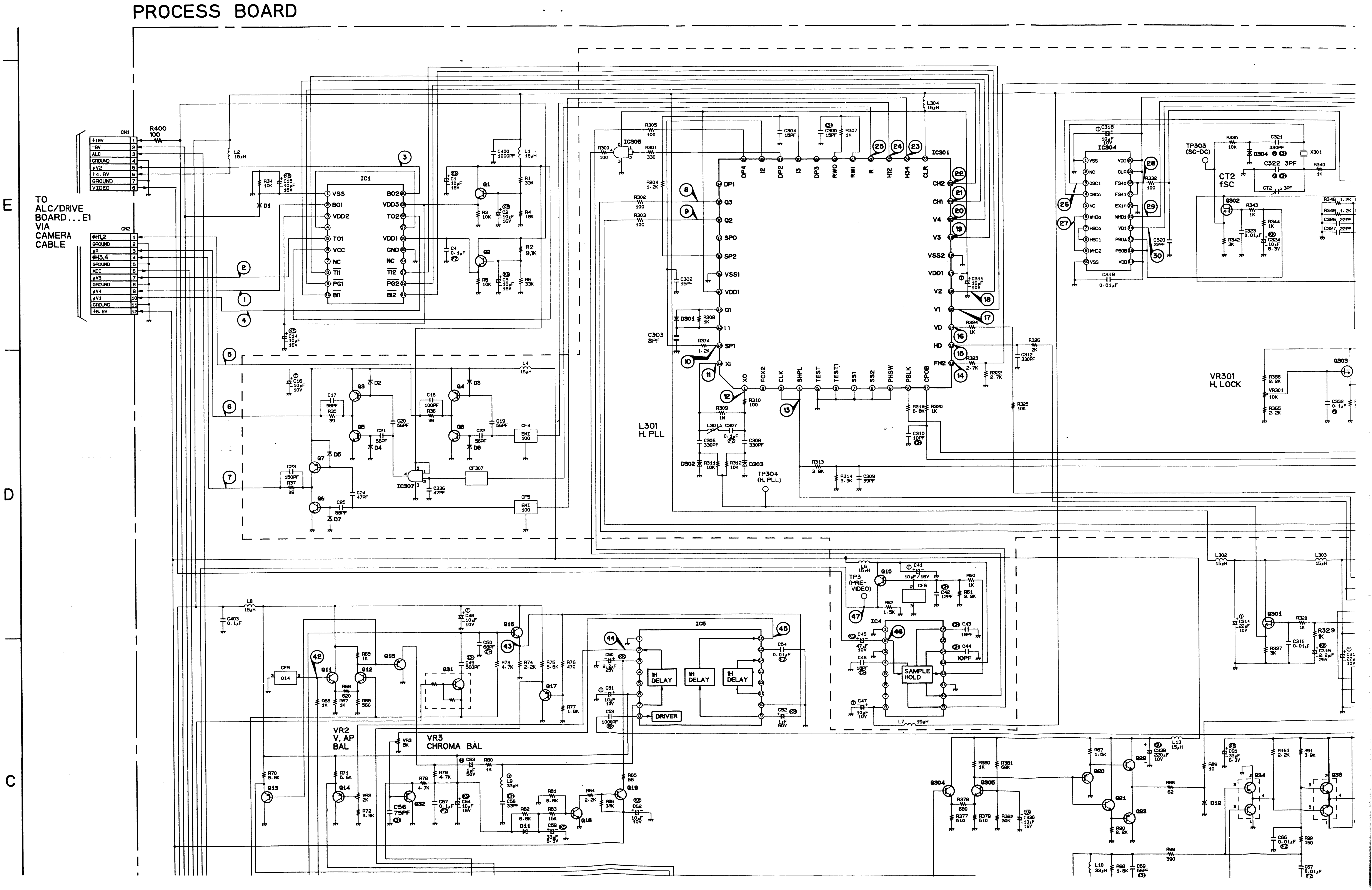
	B	C	E
Q1	1.7	4.8	1.1
Q2	13.1	16.7	12.4
Q3	8.4	—	8.4
Q4	8.0	-20.0	8.4
Q5	0.6	—	0
Q6	0.3	0.7	0
Q7	8.1	-1.5	0
Q8	0.3	-13	0
Q10	4.5	0	3.9
Q11	1.8	4.7	1.2
Q12	1.7	3.4	0.9
Q13	3.4	0	4.0
Q14	2.0	0	2.6
Q15	3.4	0	4.0
Q16	1.8	4.8	1.8
Q17	0.9	0	1.5
Q18	0.7	0.1	0

	B	C	E
Q19	7.8	8.5	8.6
Q20	5.3	0	5.9
Q21	5.3	8.6	4.7
Q22	5.9	8.6	5.3
Q23	4.7	0	5.3
Q28	2.4	4.6	1.9
Q29	0	3.6	0
Q30	1.7	0	2.3
Q31	0.8	1.5	1.7
Q32	1.5	0	2.1
Q35	2.4	5.3	0
Q301	G 2.0	D 4.8	S 2.3
Q302	G 2.7	D 4.8	S 2.9
Q303	G 2.2	D 4.8	S 2.5
Q304	2.5	8.6	1.8
Q305	2.4	5.3	1.8

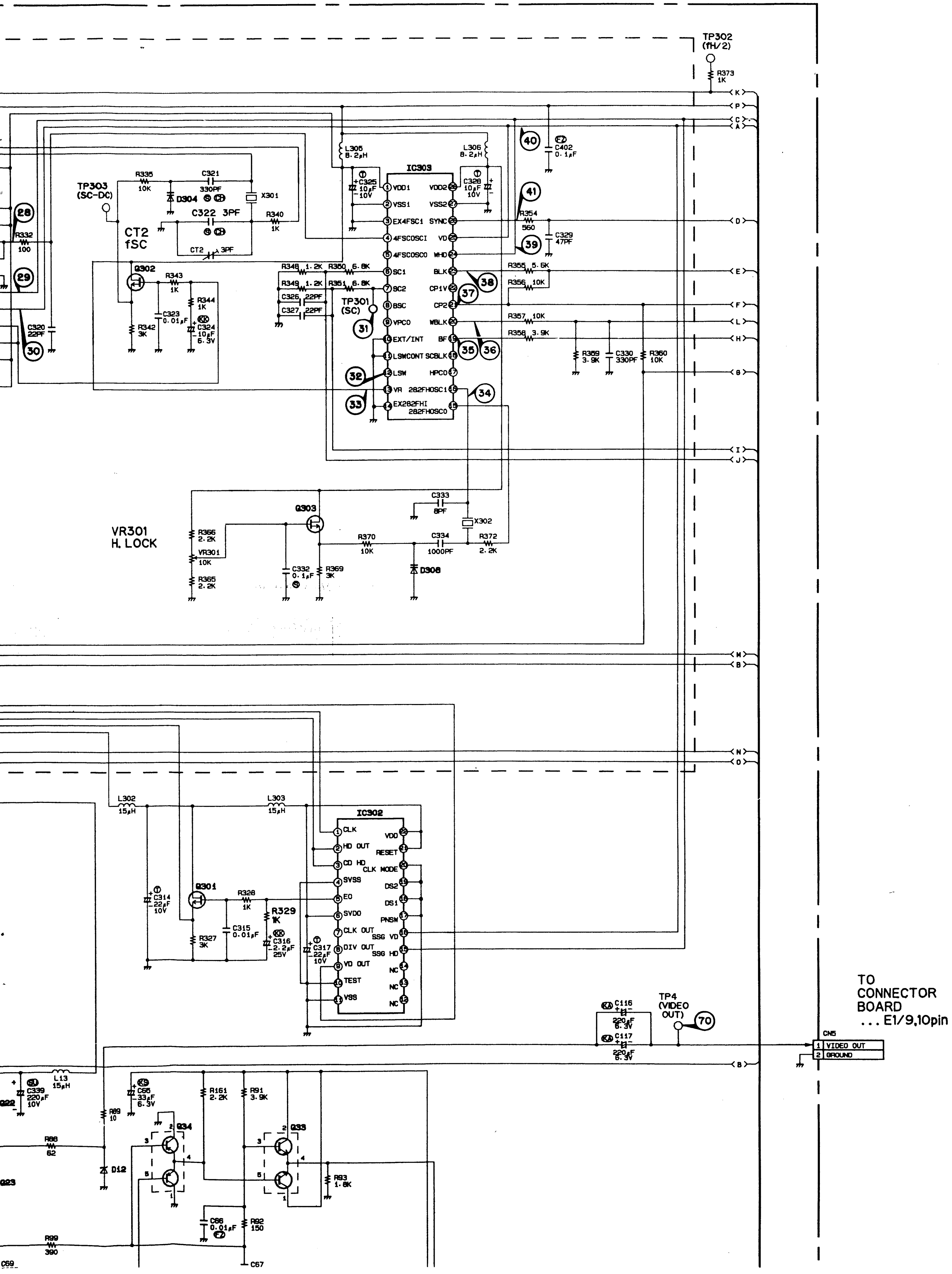
	IC8	IC9	IC301		IC8	IC9	IC301
Pin 1	3.0	1.7	2.4	Pin 25	3.0	1.4	1.9
2	1.9	1.9	0	26	1.8	4.4	6.7
3	1.8	2.1	0	27	3.2	1.7	2.3
4	1.8	1.8	1.8	28	1.8	2.5	—
5	0	0	0	29	1.7	1.3	—
6	1.6	2.7	0	30	0	1.8	1.1
7	3.0	0	0	31	1.7	1.7	—
8	1.7	0.7	0	32	1.7	1.7	1.1
9	1.7	0	0	33	0	1.6	—
10	3.0	0	0	34	1.7	1.7	—
11	1.9	0	0.1	35	1.7	2.9	-2.0
12	2.4	0	2.3	36	2.6	0	-0.6
13	1.3	1.7	0.5	37	1.7	2.9	1.3
14	0	1.9	0.1	38	1.7	1.1	0
15	2.3	2.3	0	39	1.7	1.7	0
16	0	1.7	0	40	0	1.7	4.6
17	1.7	4.6	0	41	0	2.8	—
18	1.7	2.6	0	42	0	4.7	1.2
19	0	1.7	4.3	43	0.8	0	0.3
20	2.5	1.9	4.4	44	0	0.7	2.3
21	0	0	4.6	45	0	2.3	
22	2.4	2.3	0	46	0	0	
23	0	0	4.7	47	0	0	
24	1.6	0	2.5	48	1.7	1.5	

	Q33	Q34
1	4.7	0
2	4.7	0
3	2.1	1.9
4	1.7	2.3
5	0	1.7

SCHEMATIC DIAGRAM OF PROCESS BOARD



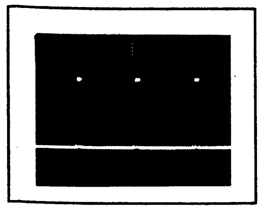
PROCESS BOARD
TO ALC/DRIVE BOARD...E1 VIA CAMERA CABLE
CN1
+16V
-8V
ALC
GROUND
φV2
+4.8V
GROUND
VIDEO
CN2
φHL2
GROUND
φR
φH3,4
GROUND
MIC
φV3
GROUND
φV4
φV1
GROUND
+8.6V
R400 100
L2 15μH
R34 10K
C15 10μF 16V
D1
IC1
VSS
BO1
VDD2
TO1
VCC
NC
TI1
PG1
BI1
BO2
VDD3
TO2
VDD1
GND
NC
TI2
PG2
BI2
C400 1000PF
L1 15μH
C1 10μF 16V
Q1
R1 33K
R3 10K
C2 10μF 16V
R4 18K
C4 0.1μF
Q2
R2 9.1K
R5 10K
C3 10μF 16V
R6 33K
C14 10μF 16V
L4 15μH
C16 10μF 10V
C17 56PF
R35 39
Q3
D2
Q5
C21 56PF
D4
C20 56PF
C18 100PF
R36 39
Q4
D3
Q6
C22 56PF
D5
C19 56PF
CF4 EMI 100
Q7
C23 150PF
R37 39
Q8
C25 56PF
D7
C24 47PF
IC307
C336 47PF
CF307
CF5 EMI 100
E
D
C
IC306
R300 100
R301 330
R305 100
R304 1.2K
R302 100
R303 100
C304 15PF
C305 15PF
R307 1K
L304 15μH
IC301
DP4
I2
DP2
I3
DP3
RWO
RWI
R
H12
H34
CLR
DP1
Q3
Q2
SP0
SP2
VSS1
VDD1
Q1
I1
SP1
XI
XO
FCX2
CLK
SHPL
TEST
TEST1
SS1
SS2
PHSW
PBLK
CPOB
CH2
CH1
V4
V3
VSS2
VDD1
V2
V1
VD
HD
FH2
C302 15PF
D301
R308 1K
C303 8PF
R374 1.2K
R310 100
R309 1M
L301
C307 0.1μF
C306 330PF
C308 330PF
D302
R311 10K
R312 10K
D303
TP304 (H.PLL)
L301 H.PLL
R313 3.9K
R314 3.9K
C309 39PF
R319 6.8K
R320 1K
C310 10PF
C311 10μF 10V
R324 1K
R323 2.7K
R322 2.7K
R326 2K
C312 330PF
R325 10K
C318 10μF 10V
IC304
VSS
NC
OSC1
OSCo
NC
WHDo
HSCo
HSC1
WHD2
VSS
VDD
CLR
FS4o
FS41
EXin
WHD1
VD1
PBOA
PBOB
VDD
R332 100
C319 0.01μF
C320 22PF
TP303 (SC-DC)
R335 10K
D304
C321 330PF
C322 3PF
X301
R340 1K
CT2 fSC
CT2 3PF
Q302
R343 1K
R342 3K
C323 0.01μF
R344 1K
C324 10μF 6.3V
R348 1.2K
R349 1.2K
C326 22PF
C327 22PF
Q303
VR301 H.LOCK
R366 2.2K
VR301 10K
R365 2.2K
C332 0.1μF
L302 15μH
L303 15μH
Q301
C314 22μF 10V
R327 3K
R328 1K
C315 0.01μF
R329 1K
C316 2.2μF 25V
L5 15μH
Q10
C41 10μF 16V
TP3 (PRE-VIDEO)
CF6
C42 12PF
R60 1K
R61 2.2K
R62 1.5K
IC4
C43 18PF
C45 47μF 10V
C44 10PF
C46 18PF
SAMPLE HOLD
C47 10μF 10V
L7 15μH
L8 15μH
C403 0.1μF
CF9 014
Q11
Q12
R65 1K
R66 1K
R67 1K
R68 560
R69 620
Q15
Q31
C48 10μF 10V
C49 560PF
C50 68PF
Q16
R73 4.7K
R74 2.2K
R75 5.6K
R76 470
Q17
R77 1.8K
IC5
1H DELAY
1H DELAY
1H DELAY
DRIVER
C60 2.2μF 25V
C61 10μF 10V
C53 1000PF
C54 0.01μF
C52 1μF 50V
VR2 V.AP BAL
VR3 CHROMA BAL
VR3 5K
R70 5.6K
Q13
R71 5.6K
Q14
VR2 2K
R72 3.9K
C63 1μF 50V
R80 1K
R78 4.7K
R79 4.7K
C56 75PF
Q32
C57 0.1μF
C54 10μF 16V
L9 33μH
C58 33PF
R81 6.8K
R82 6.8K
R83 15K
D11
C59 33μF 6.3V
Q18
R84 2.2K
R86 33K
R85 68
Q19
C62 10μF 10V
Q304
Q305
R380 1K
R381 56K
R378 680
R377 510
R379 510
R382 30K
C338 10μF 16V
R87 1.5K
Q20
Q22
C339 220μF 10V
L13 15μH
Q21
Q23
R90 2.2K
R88 62
R89 10
D12
C65 33μF 6.3V
Q34
R161 2.2K
R91 3.9K
Q33
C66 0.01μF
R92 150
R99 390
L10 33μH
R98 1.8K
C69 56PF
C67 0.01μF


TP302
(fH/2)
R373
1K
TP303
(SC-DC)
CT2
fSC
X301
C321
330PF
C322 3PF
R335
10K
R340
1K
D304
R332
100
Q302
R343
1K
R344
1K
R342
3K
C323
0.01μF
C324
10μF
6.3V
C320
22PF
L305
8.2μH
L306
8.2μH
C325
10μF
10V
C326
10μF
10V
IC303
VDD1
VSS1
EX4FSC1
4FSCOSC1
4FSCOSCO
SC1
SC2
BSC
VPCO
EXT/INT
LSWCONT
LSW
VR
EX282FHI
VDD2
VSS2
SYNC
VD
WHD
BLK
CP1V
CP2
WBLK
BF
SCBLK
HPCO
282FHOSC1
282FHOSCO
R348 1.2K
R349 1.2K
R350 6.8K
R351 6.8K
C326 22PF
C327 22PF
TP301
(SC)
C402
0.1μF
R354
560
C329
47PF
R355 5.6K
R356 10K
R357 10K
R358 3.9K
R359
3.9K
C330
330PF
R360
10K
VR301
H. LOCK
Q303
R366
2.2K
VR301
10K
R365
2.2K
C333
8PF
X302
R370
10K
C334
1000PF
R372
2.2K
C332
0.1μF
R369
3K
D308
L302
15μH
L303
15μH
IC302
CLK
HD OUT
CD HD
SVSS
EO
SVDD
CLK OUT
DIV OUT
VD OUT
TEST
VSS
VDD
RESET
CLK MODE
DS2
DS1
PNSW
SSG VD
SSG HD
NC
Q301
C314
22μF
10V
R328
1K
C315
0.01μF
R329
1K
R327
3K
C316
2.2μF
25V
C317
22μF
10V
C116
220μF
6.3V
C117
220μF
6.3V
TP4
(VIDEO
OUT)
TO
CONNECTOR
BOARD
... E1/9,10pin
CN5
VIDEO OUT
GROUND
L13
15μH
C339
220μF
10V
C85
33μF
6.3V
R161
2.2K
R91
3.9K
R89
10
R88
62
Q34
Q33
D12
R93
1.8K
C86
0.01μF
R92
150
R99
390
C67
C69
28
29
30
31
32
33
34
35
36
37
38
39
40
41
70
K
P
C
A
D
E
F
L
H
B
I
J
M
N
O

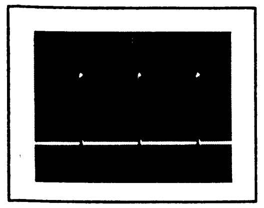
PROCESS BOARD

IC1	E2
IC4	C4
IC5	C3
IC8	B2
IC9	B4
IC301	E3
IC302	D5
IC303	E5
IC304	F4
IC305	E3
IC307	D2
Q1	E2
Q2	E2
Q3	D2
Q4	D2
Q5	D2
Q6	D2
Q7	D2
Q8	D2
Q10	D3
Q11	C2
Q12	C2
Q13	C1
Q14	C2
Q15	C2
Q16	D2
Q17	C2
Q18	C2
Q19	C3
Q20	C4
Q21	C4
Q22	C4
Q23	C4
Q28	A3
Q29	A3
Q30	A4
Q31	C2
Q32	C2
Q33	C5
Q34	C5
Q301	D5
Q302	E5
Q303	D5
Q304	C4
Q305	C4
D1	E1
D2	D2
D3	D2
D4	D2
D5	D2
D6	D2
D7	D2
D11	C2
D12	C5
D14	A2
D15	B4
D301	E3
D302	B3
D303	B3
D304	E5
D308	D5

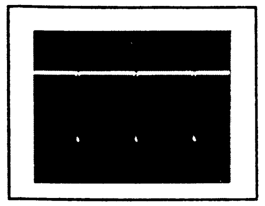
1. 20μsec/DIV, 2V/DIV



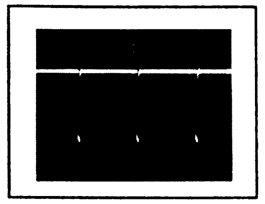
2. 20μsec/DIV, 2V/DIV



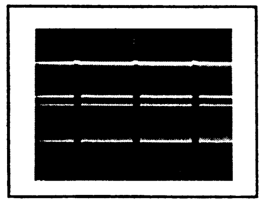
3. 20μsec/DIV, 2V/DIV



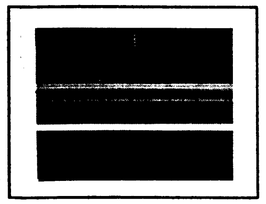
4. 20μsec/DIV, 2V/DIV



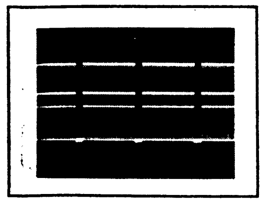
5. 20μsec/DIV, 2V/DIV



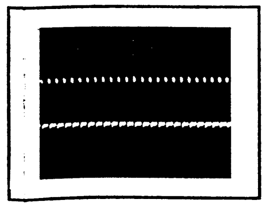
6. 50μsec/DIV, 2V/DIV



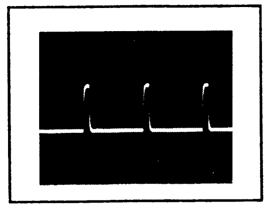
7. 20μsec/DIV, 2V/DIV



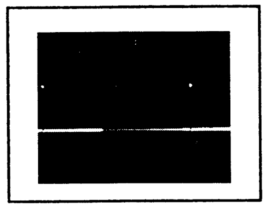
8. 0.5μsec/DIV, 2V/DIV



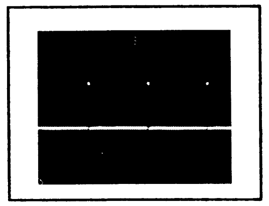
15. 20μsec/DIV, 2V/DIV



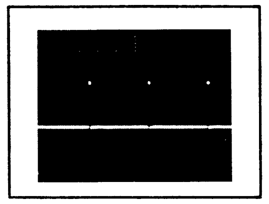
16. 5msec/DIV, 2V/DIV



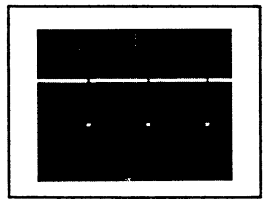
17. 20μsec/DIV, 2V/DIV



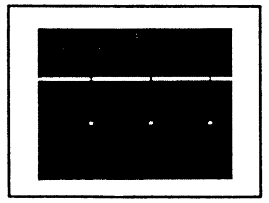
18. 20μsec/DIV, 2V/DIV



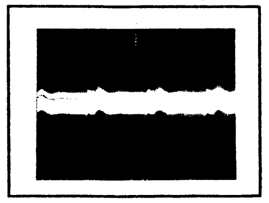
19. 20μsec/DIV, 2V/DIV



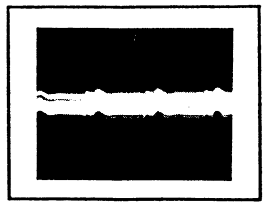
20. 20μsec/DIV, 2V/DIV



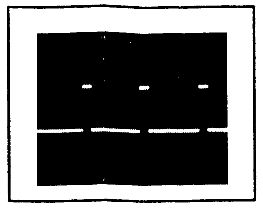
21. 20μsec/DIV, 0.1V/DIV



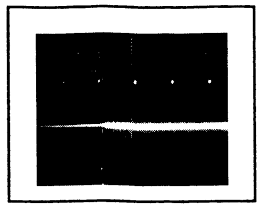
22. 20μsec/DIV, 0.1V/DIV



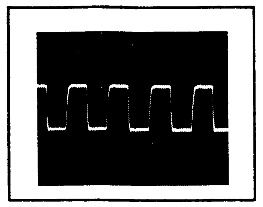
23. 20μsec/DIV, 2V/DIV



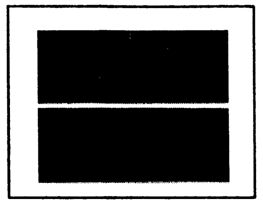
30. 10mμsec/DIV, 2V/DIV



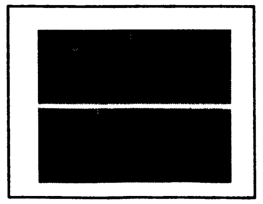
31. 0.1μsec/DIV, 2V/DIV



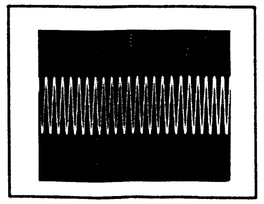
32. 0.2msec/DIV, 0.1V/DIV



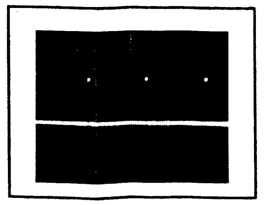
33. 0.2msec/DIV, 0.1V/DIV



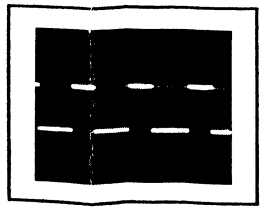
34. 0.5μsec/DIV, 1V/DIV



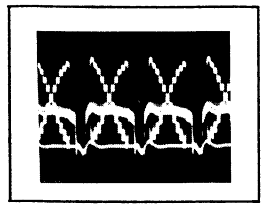
35. 20μsec/DIV, 2V/DIV



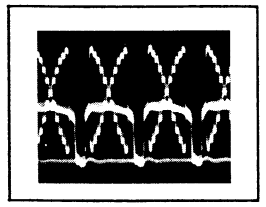
36. 20μsec/DIV, 2V/DIV



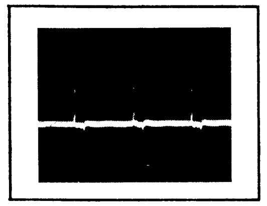
43. 20μsec/DIV, 0.1V/DIV



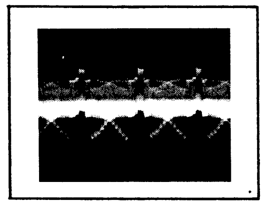
44. 20μsec/DIV, 0.1V/DIV



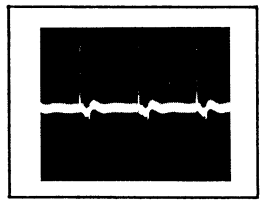
45. 20μsec/DIV, 0.2V/DIV



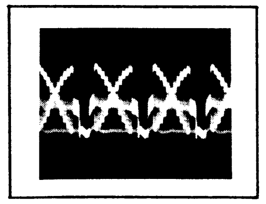
46. 20μsec/DIV, 0.2V/DIV



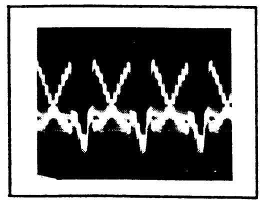
47. 20μsec/DIV, 0.2V/DIV



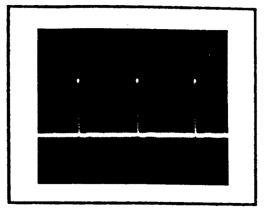
48. 20μsec/DIV, 0.1V/DIV



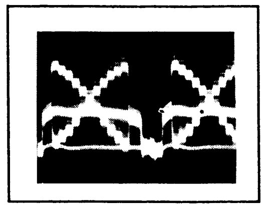
49. 20μsec/DIV, 0.1V/DIV



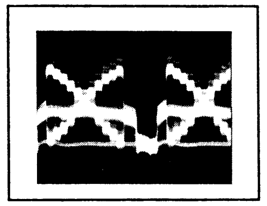
50. 20μsec/DIV, 0.1V/DIV



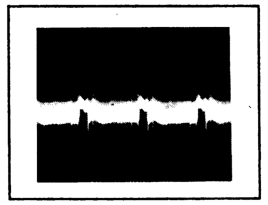
57. 10μsec/DIV, 0.1V/DIV



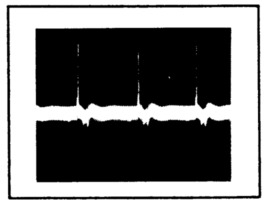
58. 10μsec/DIV, 0.1V/DIV



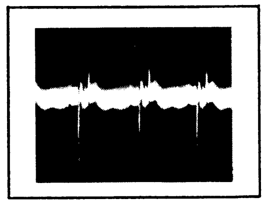
59. 10μsec/DIV, 0.1V/DIV



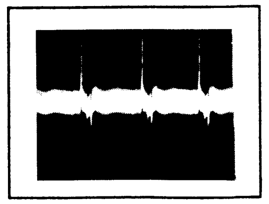
60. 20μsec/DIV, 0.1V/DIV



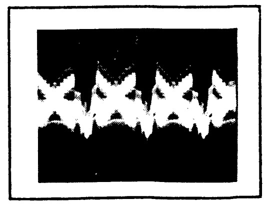
61. 20μsec/DIV, 0:1V/DIV



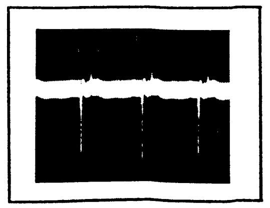
62. 20μsec/DIV, 50mV/DIV

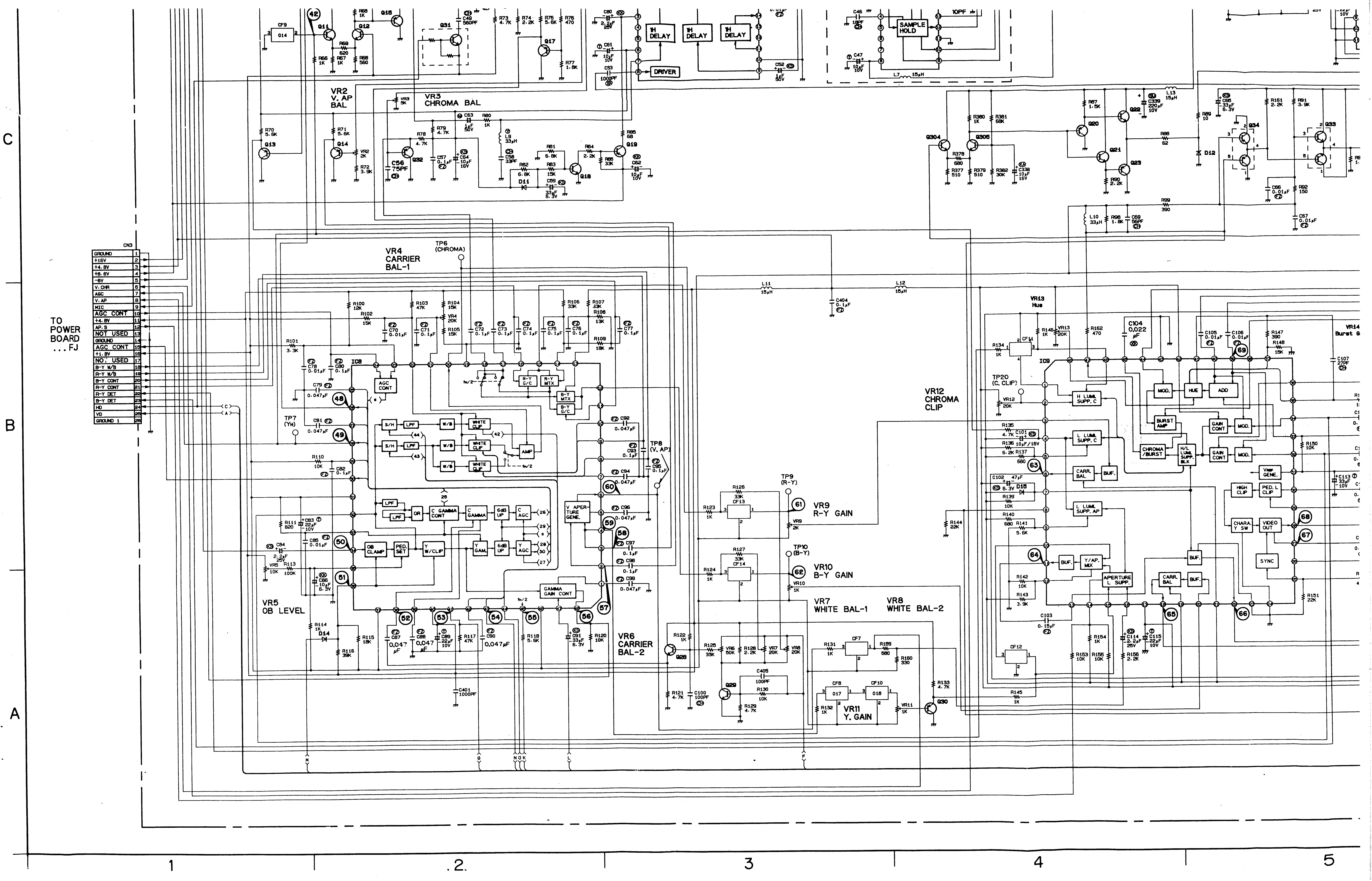


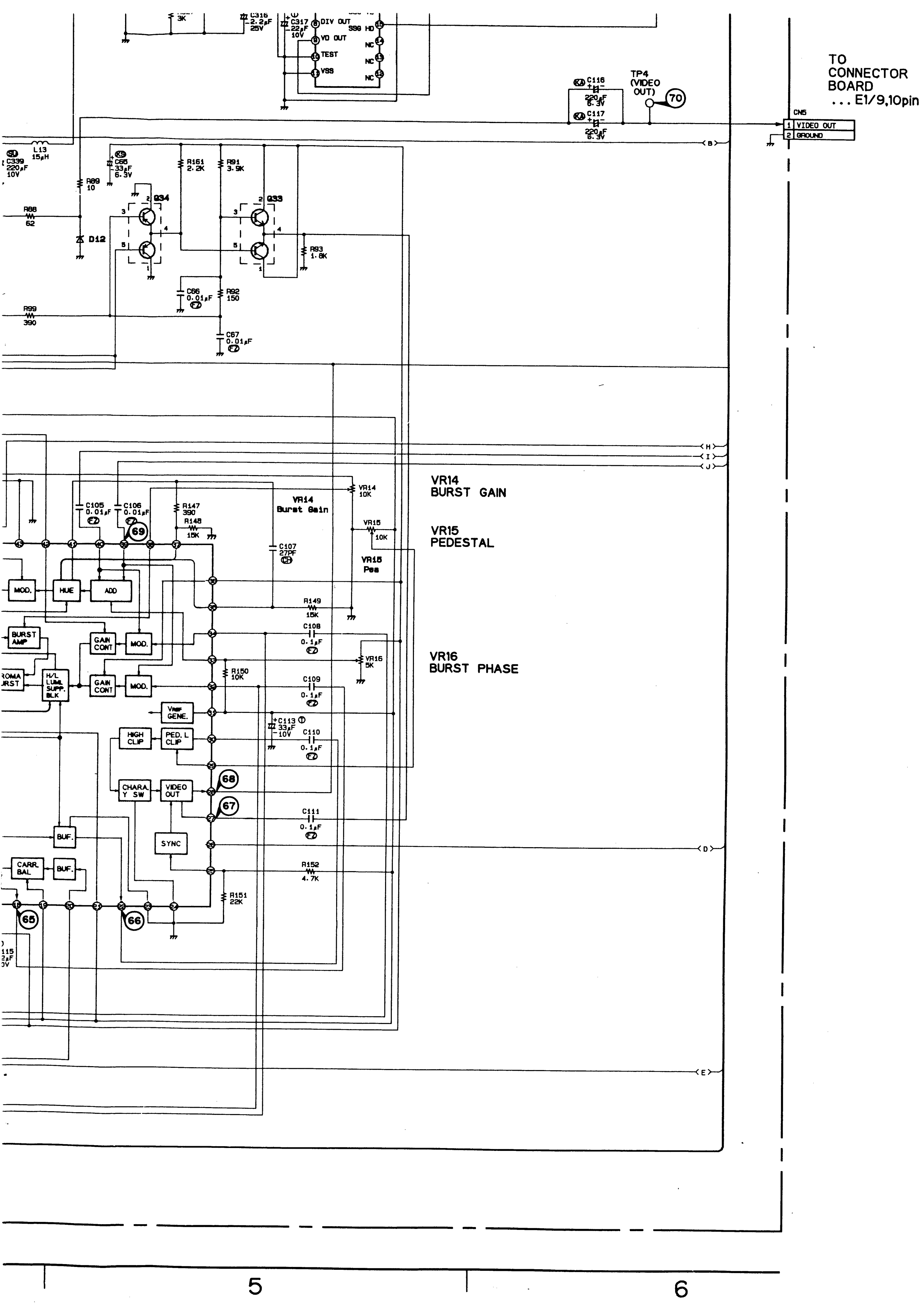
63. 20μsec/DIV, 50mV/DIV



64. 20μsec/DIV, 50mV/DIV

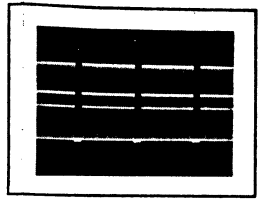



C
B
A
1
2
3
4
5
TO POWER BOARD ...FJ
CN3
GROUND 1
+15V 2
+4.8V 3
+8.6V 4
-8V 5
V.CHR 6
AGC 7
V.AP 8
MIC 9
AGC CONT 10
+4.8V 11
AP.S 12
NOT USED 13
GROUND 14
AGC CONT 15
+1.8V 16
NOT USED 17
B-Y W/B 18
R-Y W/B 19
B-Y CONT 20
R-Y CONT 21
R-Y DET 22
B-Y DET 23
HD 24
VD 25
GROUND 1 26
VR2 V.AP BAL
VR3 CHROMA BAL
VR4 CARRIER BAL-1
TP6 (CHROMA)
TP7 (YH)
TP8 (V.AP)
IC8
AGC CONT
R-Y G/C
R-Y MTX
B-Y MTX
B-Y G/C
S/H
LPF
W/B
WHITE CLIP
AMP
C GAMMA CONT
C GAMMA
6dB UP
C AGC
OB CLAMP
PED. SET
Y W/CLIP
Y GAM.
Y AGC
V APERTURE GENE.
GAMMA GAIN CONT
VR5 OB LEVEL
VR6 CARRIER BAL-2
1H DELAY
DRIVER
SAMPLE HOLD
TP9 (R-Y)
VR9 R-Y GAIN
TP10 (B-Y)
VR10 B-Y GAIN
VR7 WHITE BAL-1
VR8 WHITE BAL-2
VR11 Y. GAIN
VR12 CHROMA CLIP
VR13 Hue
VR14 Burst
TP20 (C. CLIP)
IC9
H LUMI. SUPP. C
L LUMI. SUPP. C
CARR. BAL
BUF.
L LUMI. SUPP. AP
Y/AP. MIX
APERTURE L SUPP.
MOD.
HUE
ADD
BURST AMP
CHROMA /BURST
H/L LUMI. SUPP. BLK
GAIN CONT
VMIX GENE.
HIGH CLIP
PED. L CLIP
CHARA. Y SW
VIDEO OUT
SYNC

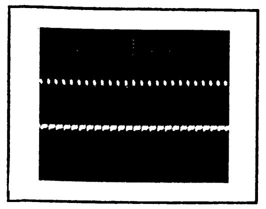

TO
CONNECTOR
BOARD
... E1/9,10pin
CN5
1 VIDEO OUT
2 GROUND
TP4
(VIDEO
OUT)
70
C116
220μF
6.3V
C117
220μF
6.3V
DIV OUT
VD OUT
TEST
VSS
S98 HD
NC
L13
15μH
C339
220μF
10V
C65
33μF
6.3V
R89
10
R88
62
D12
Q34
Q33
R161
2.2K
R91
3.9K
R93
1.8K
C66
0.01μF
R92
150
C67
0.01μF
R99
390
C105
0.01μF
C106
0.01μF
R147
390
R148
15K
69
VR14
Burst Gain
VR14
10K
VR15
10K
VR16
Ped
C107
27PF
R149
15K
C108
0.1μF
VR16
5K
R150
10K
C109
0.1μF
C113
33μF
10V
C110
0.1μF
C111
0.1μF
R152
4.7K
R151
22K
VR14
BURST GAIN
VR15
PEDESTAL
VR16
BURST PHASE
MOD.
HUE
ADD
BURST
AMP
GAIN
CONT
MOD.
CHROMA
BURST
H/L
LUMI.
SUPP.
BLK
GAIN
CONT
MOD.
Vref
GENE.
HIGH
CLIP
PED. L
CLIP
CHARA.
Y SW
VIDEO
OUT
68
67
SYNC
BUF.
CARR.
BAL
BUF.
65
66
H
I
J
B
D
E
5
6

D303	B3
D304	E5
D308	D5

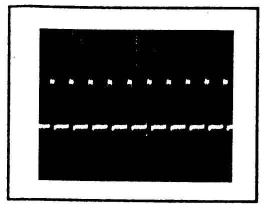
7. 20μsec/DIV, 2V/DIV



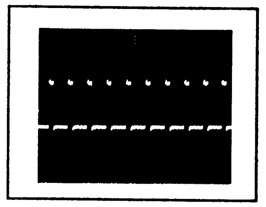
8. 0.5μsec/DIV, 2V/DIV



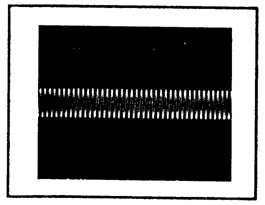
9. 0.2μsec/DIV, 2V/DIV



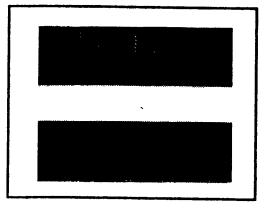
10. 0.2μsec/DIV, 2V/DIV



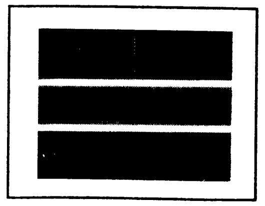
11. 0.2μsec/DIV, 2V/DIV



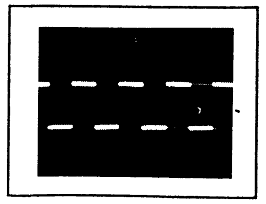
12. 10μsec/DIV, 20mV/DIV



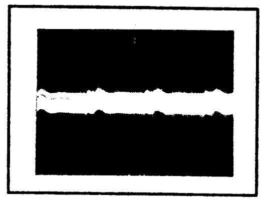
13. 2μsec/DIV, 2V/DIV



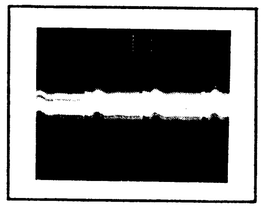
14. 50μsec/DIV, 2V/DIV



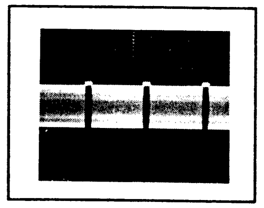
21. 20μsec/DIV, 0.1V/DIV



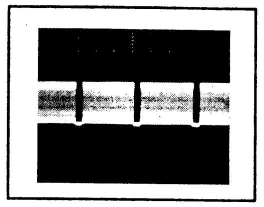
22. 20μsec/DIV, 0.1V/DIV



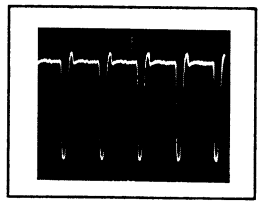
23. 20μsec/DIV, 2V/DIV



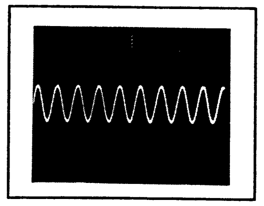
24. 20μsec/DIV, 2V/DIV



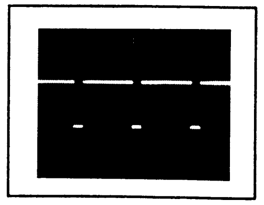
25. 50nsec/DIV, 1V/DIV



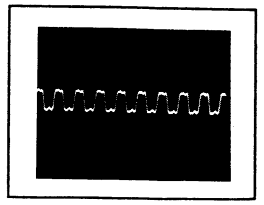
26. 50nsec/DIV, 1V/DIV



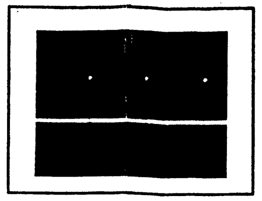
27. 20μsec/DIV, 2V/DIV



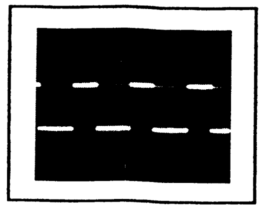
28. 50nsec/DIV, 5V/DIV



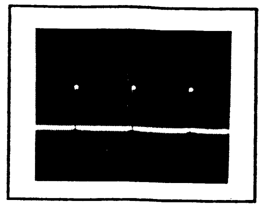
35. 20μsec/DIV, 2V/DIV



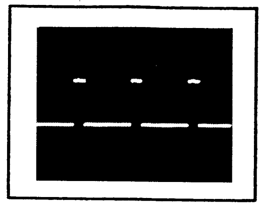
36. 20μsec/DIV, 2V/DIV



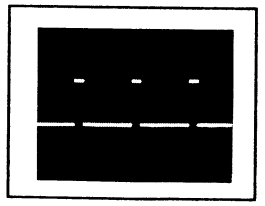
37. 20μsec/DIV, 2V/DIV



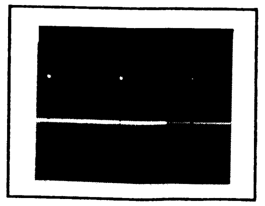
38. 20μsec/DIV, 2V/DIV



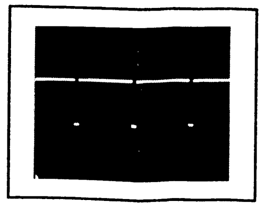
39. 20μsec/DIV, 2V/DIV



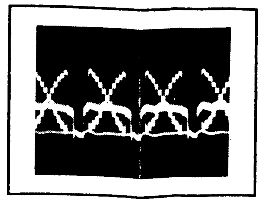
40. 5msec/DIV, 2V/DIV



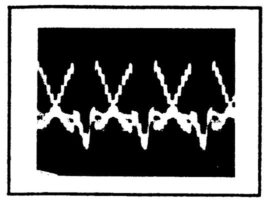
41. 20μsec/DIV, 2V/DIV



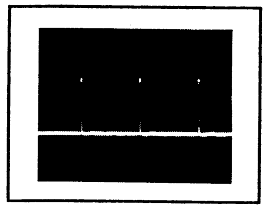
42. 20μsec/DIV, 0.1V/DIV



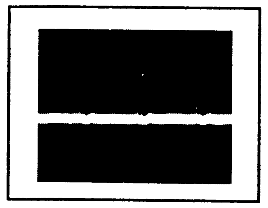
49. 20μsec/DIV, 0.1V/DIV



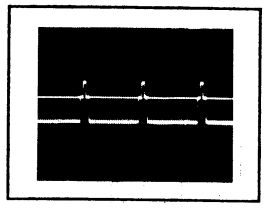
50. 20μsec/DIV, 0.1V/DIV



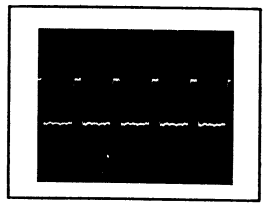
51. 20μsec/DIV, 0.5V/DIV



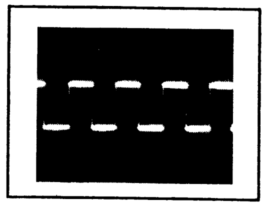
52. 20μsec/DIV, 2V/DIV



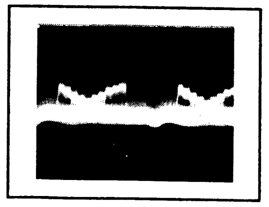
53. 20μsec/DIV, 2V/DIV



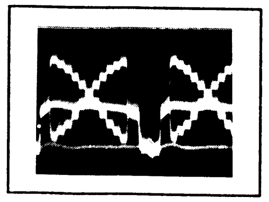
54. 0.1μsec/DIV, 2V/DIV



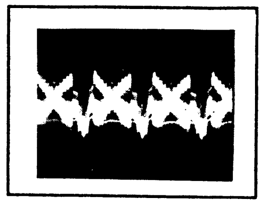
55. 50μsec/DIV, 1V/DIV



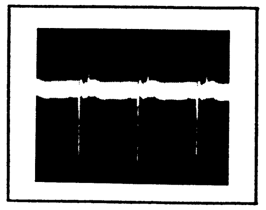
56. 10μsec/DIV, 0.1V/DIV



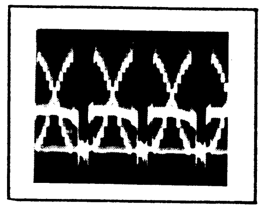
63. 20μsec/DIV, 50mV/DIV



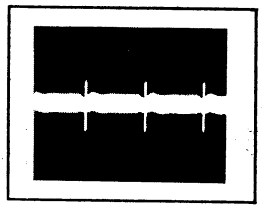
64. 20μsec/DIV, 50mV/DIV



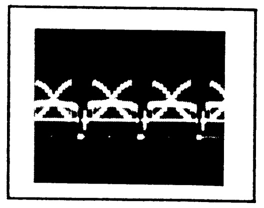
65. 20μsec/DIV, 0.1V/DIV



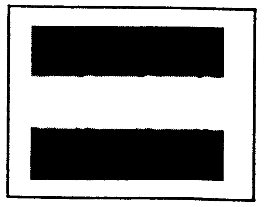
66. 20μsec/DIV, 0.1V/DIV



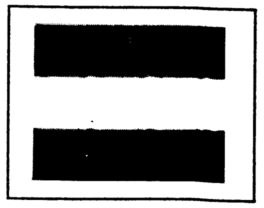
67. 20μsec/DIV, 0.1V/DIV



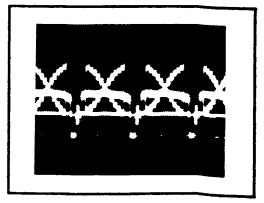
68. 20μsec/DIV, 0.5V/DIV



69. 20μsec/DIV, 0.2V/DIV

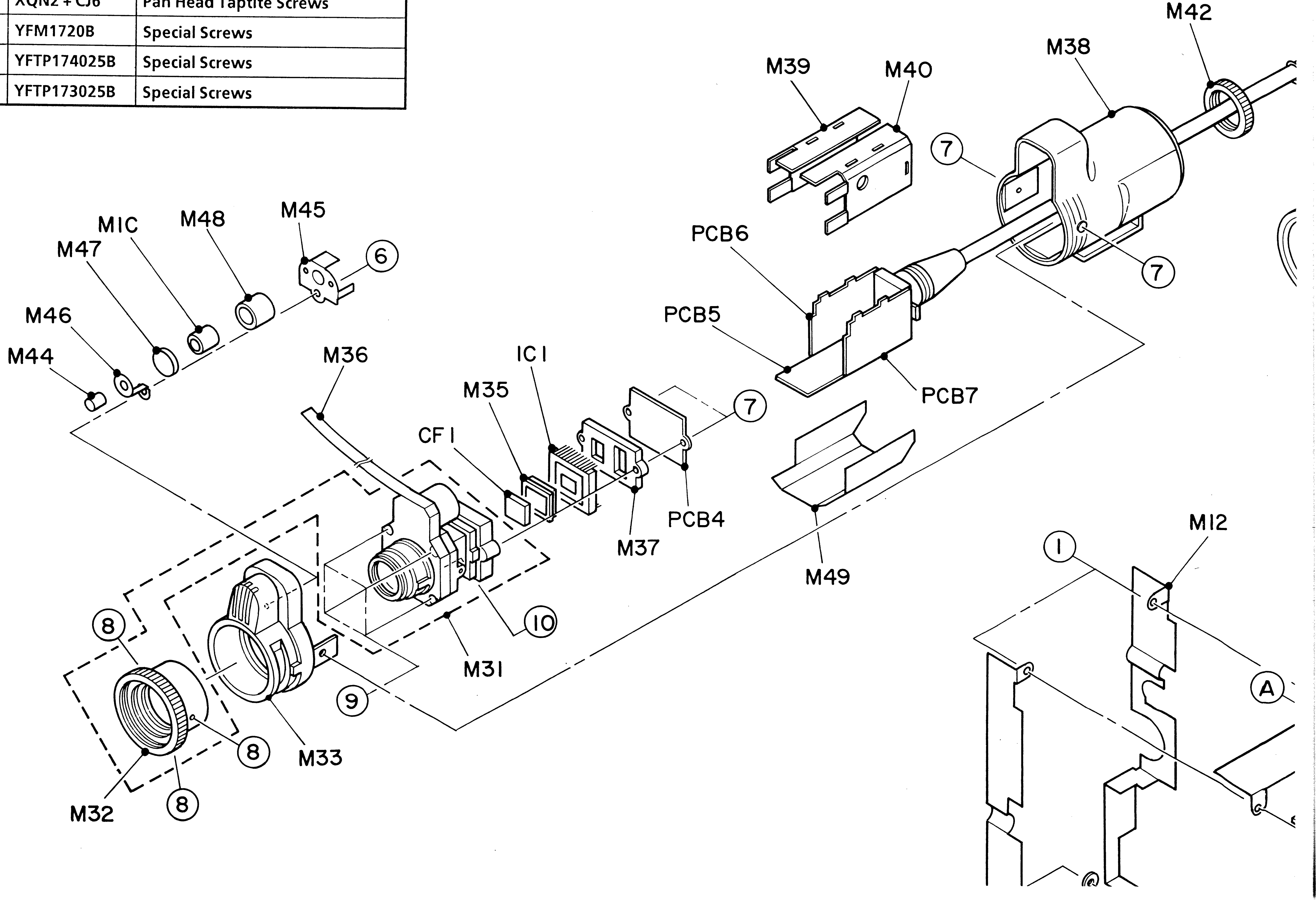


70. 20μsec/DIV, 0.2V/DIV

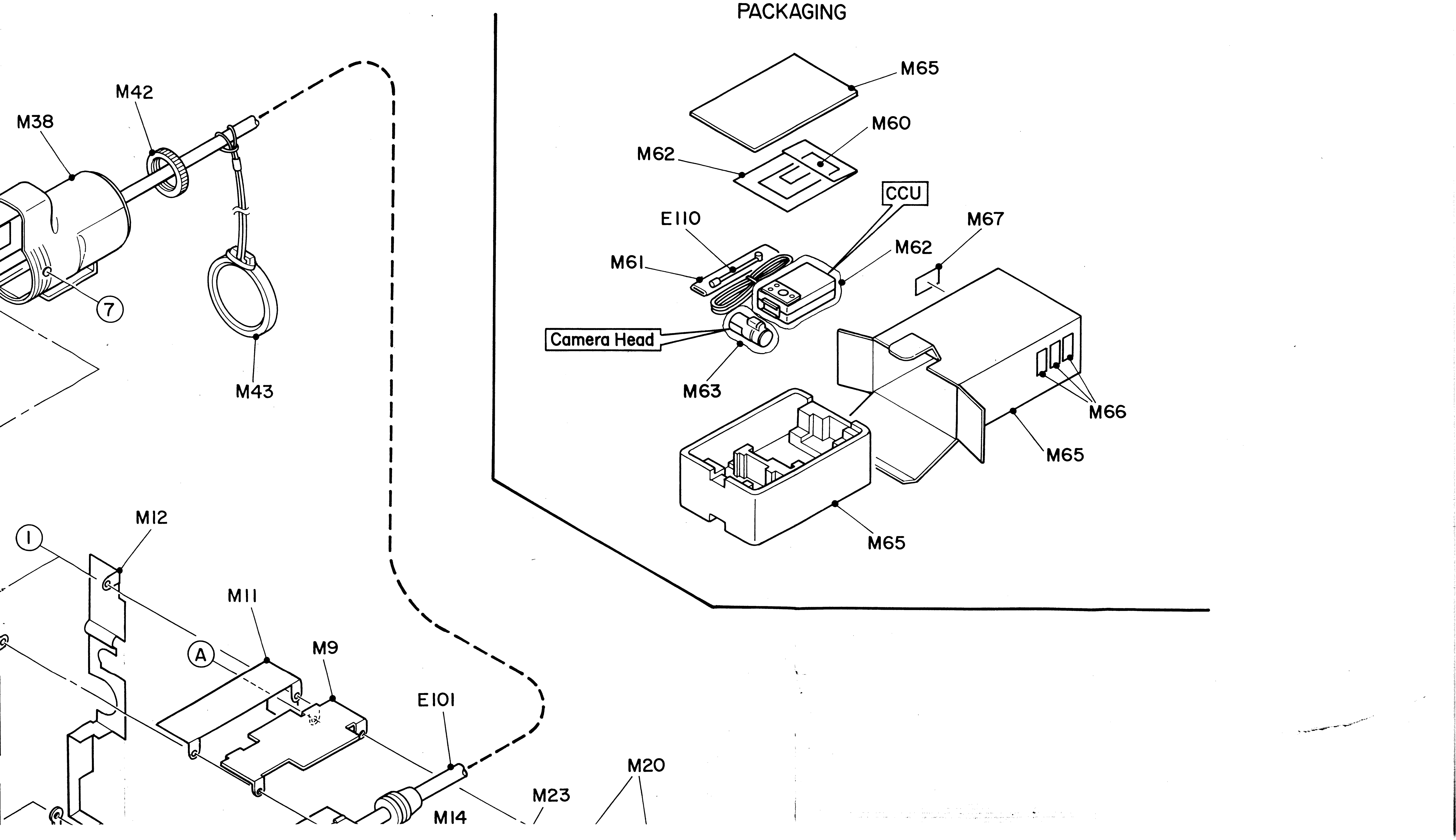


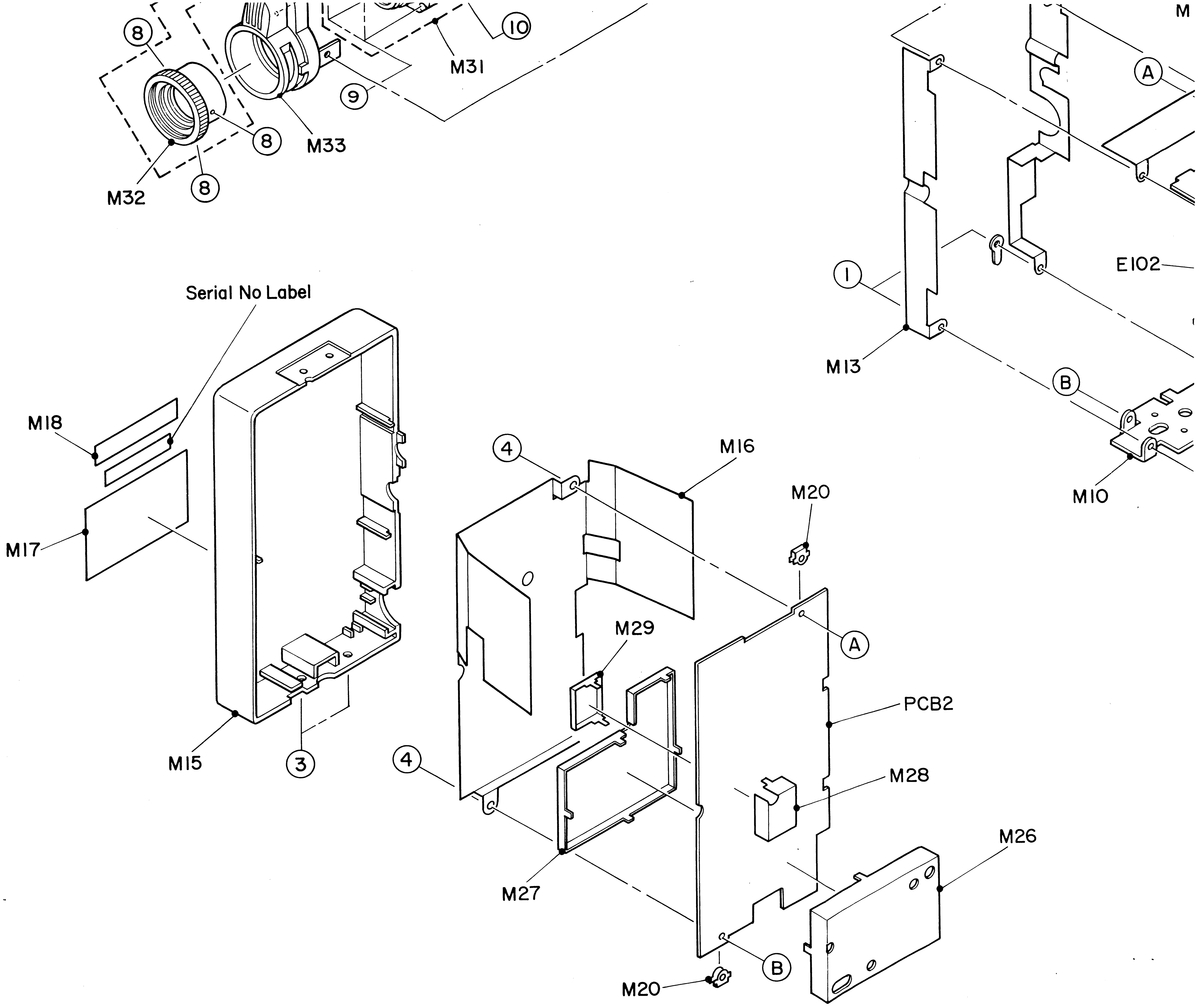
○ Numbers show screws.

No.	Screws	Description
①	XTB26 + 8CFX	Binding Head Tapping Screws
②	XSS2 + 6FX	Flush Head Machine Screws
③	XSS26 + 6FXK	Flush Head Machine Black Screws
④	XYN26 + F6FX	Machine Screw and Washer Ass'y
⑤	XQN2 + AG2	Pan Head Taptite Screws
⑥	XQN2 + CJ4	Pan Head Taptite Screws
⑦	XQN2 + CJ6	Pan Head Taptite Screws
⑧	YFM1720B	Special Screws
⑨	YFTP174025B	Special Screws
⑩	YFTP173025B	Special Screws

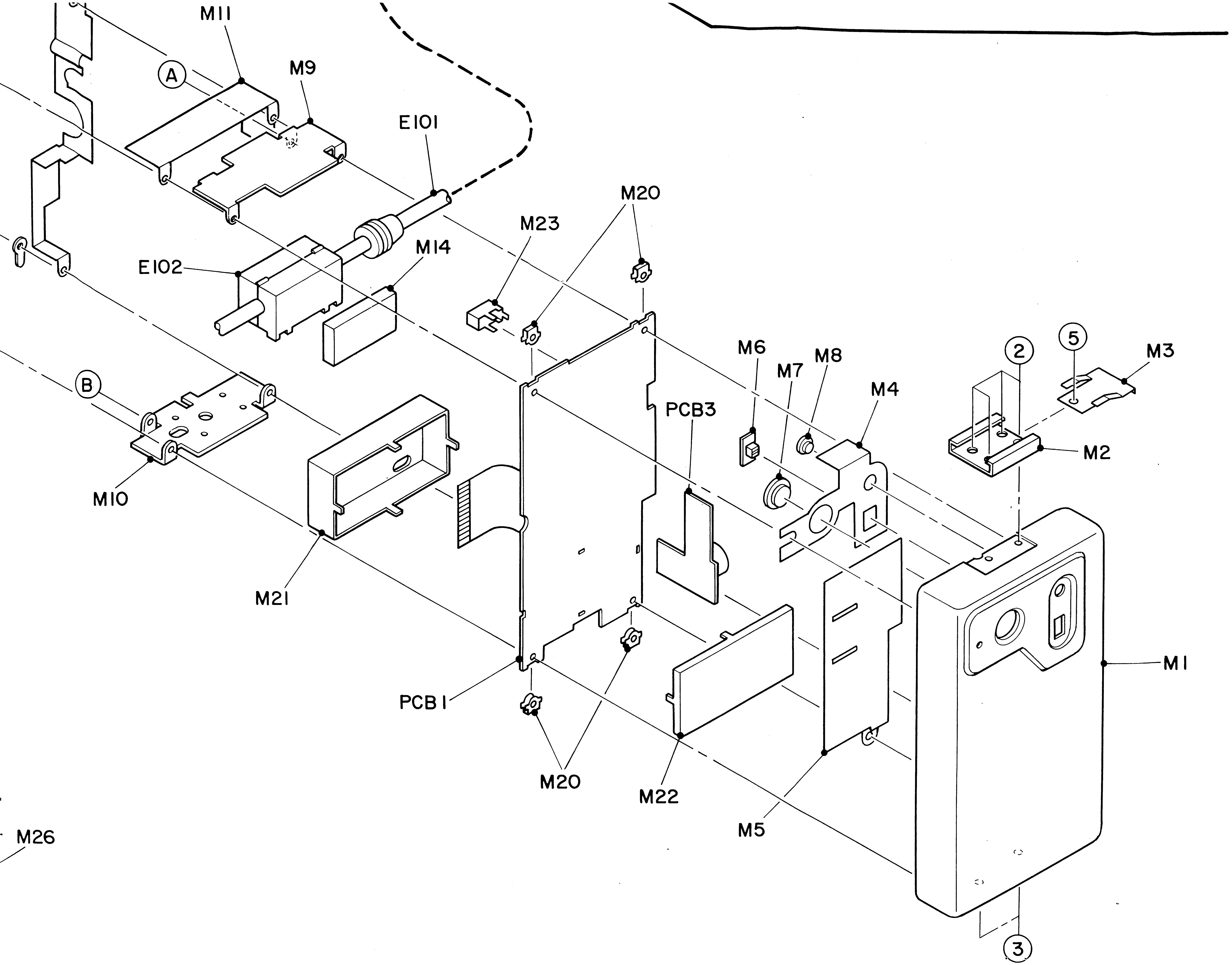

M42
M38
M39
M40
7
PCB6
7
MIC
M48
M45
6
M47
M46
M44
M36
IC1
M35
CF1
PCB5
PCB7
7
PCB4
M37
M49
M12
1
A
10
M31
8
9
M33
8
M32
8

EXPLODED VIEW


PACKAGING
M65
M60
M62
CCU
E110
M67
M62
M61
Camera Head
M63
M66
M65
M65
M42
M38
7
M43
M12
I
M11
A
M9
E101
M20
M23
M14



M
8
10
M31
9
8
M33
8
M32
A
E102
1
M13
B
M10
Serial No Label
M18
M17
M15
3
4
M16
M20
A
M29
PCB2
4
M28
M27
M26
B
M20


M11
A
M9
E101
M20
M23
M14
E102
M6
M8
M7
M4
2
5
M3
M2
PCB3
B
M10
M21
M1
PCB1
M20
M22
M5
M26
3

REPLACEMENT PARTS LIST

Important Notice

1. Components identified by "⚠" mark have special characteristics important for safety.
   When replacing any of these components, use only manufacturer's specified parts.
2. Printed circuit board assembly with mark (NLA) is no longer available after production discontinuation of the complete set.

REF.NO.	PART NO.	DESCRIPTION
MISCELLANEOUS		
IC1	YWMN3745NC	Image Sensor
MIC	YWWM-60AT	MIC Assy
CF1	YW0GBF145	Filter
CF2	YFBL1RN1A62	Filter
E101	YWL26700X600	Camera Cord
E102	YWRISC5F	Filter
M1	YWV5EA0894A2	Upper Cover
M2	YWV5MA0034A4	Shoe
M3	YWV4JA0331A4	Spring
M4	YWV2HA0907A4	Shield Parts
M5	YWV2HA0920A4	Shield Parts
M6	YFV5RA0057B4	Knob
M7	YWV5RA0309A4	Knob
M8	YWV5RA0310A4	Knob
M9	YWV2SA1692A4	Mounting Angle
M10	YWV2TA0231A4	Mounting Bracket
M11	YWV2HA0918A4	Shield Parts
M12	YWV2HA0905A4	Shield Parts
M13	YWV2HA0906A4	Shield Parts
M14	YWV2FA0488A4	Cushion
M15	YWV5EA0895A2	Bottom Cover
M16	YWV2HA0902A4	Shield Parts
M17 ⚠	YWV7QA2331A4	Main Label
M18	YFV7MA0099A4	Safety Label
M31	YWWPR	Lens Assy
M33	YWV5EA0897A3	Front Cover
M35	YWV3CA0220A4	Parts Holder
M36	YWV2HA0917A4	Shield Parts
M37	YWV2NA0340A4	Spacer
M38	YWV5EA0898A2	Rear Cover
M39	YWV2HA0911A4	Shield Parts
M40	YWV2HA0912A4	Shield Parts
M41	YWV2HA0913A4	Shield Parts
M42	YWV1FA0058A4	Rear Nut
M43	YWV5GA0097A4	Lens Cap
M44	YWV6CA0095A4	Wind Screen
M45	YWV2HA0909A4	Shield Parts
M46	YWV2HA0910A4	Shield Parts
M47	YWV3AA0126A4	Dust Proof Parts
M48	YWV3CA0219A4	Parts Holder

REF.NO.	PART NO.	DESCRIPTION	
POWER BOARD			
PCB1 (NLA)	YWVKBGAF5E2A	Printed Circuit Board Assy	
IC1	YWFA7611M	IC	
IC2,3	AN1324NS	IC	
IC4	MN4052BS	IC	
IC5	MN1551CCQ	IC	
IC6,7	NJM2904M	IC	
IC9,10	NJM4558M	IC	
IC11	MN4053BS	IC	
IC12	AN1393S	IC	
IC13	AN78L06M	IC	
Q1	2SD1526	Transistor	
Q5	2SD1819-QRS	Transistor	
Q6,7	2SB1218-QRS	Transistor	
Q8	2SB766A-QR	Transistor	
Q9	2SD1819-QRS	Transistor	
Q10	2SB1218-QRS	Transistor	
Q11	2SD1819-QRS	Transistor	
Q12-15	2SC3929-RS	Transistor	
Q16-19	2SD1819-QRS	Transistor	
Q20	2SB1218-QRS	Transistor	
Q21	2SK663-QRS	FET	
Q22,23	XN4501	Transistor	
Q24	XN1401	Transistor	
Q25	2SB1218-QRS	Transistor	
Q26	XN4401	Transistor	
D1	MA152K	Diode	
D2	YWERA84009	Diode	
D3	MA152K	Diode	
D4	MA1068M	Diode	
D5,6	MA141K	Diode	
D7	MA157TW	Diode	
D8	YWERA82004	Diode	
D9,10	MA141K	Diode	
D11,12	MA141WK	Diode	
D13,15	MA157TW	Diode	
D16,17	YWMA1120M	Diode	
D18	0A90AR	Diode	
D19	LN086WP38	LED	
D21-23	MA143	Diode	
D24	MA157TW	Diode	
D300	MA143	Diode	
R1	ERJ3GEYJ330	Carbon	33 ohms 1/16W
R2	ERJ3GEYJ361	Carbon	360 ohms 1/16W
R3	ERJ3GEYJ563	Carbon	56K ohms 1/16W
R8	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W

REF.NO.	PART NO.	DESCRIPTION		REF.NO.	PART NO.	DESCRIPTION	
R9	ERJ3GEYJ104	Carbon	100K ohms 1/16W	R76	ERJ3GEYJ100	Carbon	10 ohms 1/16W
R10	ERJ3GEYJ471	Carbon	470 ohms 1/16W	R77	ERJ3GEYJ473	Carbon	47K ohms 1/16W
R11	ERJ3GEYJ104	Carbon	100K ohms 1/16W	R78	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R12	ERJ3GEYJ302	Carbon	3K ohms 1/16W	R79	ERJ3GEYJ204	Carbon	200K ohms 1/16W
R13	YWR1220P243D	Metal	24K ohms	R82	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W
R14	YFR1220P104D	Metal	100K ohms	R83	ERJ3GEYJ204	Carbon	200K ohms 1/16W
R15	ERJ3GEYJ104	Carbon	100K ohms 1/16W	R84	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R16	ERJ3GEYJ272	Carbon	2.7K ohms 1/16W	R85	ERJ3GEYJ104	Carbon	100K ohms 1/16W
R17	ERJ3GEYJ152	Carbon	1.5K ohms 1/16W	R87	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R18	ERJ3GEYJ511	Carbon	510 ohms 1/16W	R88	ERJ3GEYJ204	Carbon	200K ohms 1/16W
R19	ERJ3GEYJ393	Carbon	39K ohms 1/16W	R91	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W
R20	ERJ3GEYJ272	Carbon	2.7K ohms 1/16W	R92	ERJ3GEYJ104	Carbon	100K ohms 1/16W
R21,22	ERJ3GEYJ104	Carbon	100K ohms 1/16W	R93	ERJ3GEYJ204	Carbon	200K ohms 1/16W
R23	ERJ3GEYJ102	Carbon	1K ohms 1/16W	R94	ERJ3GEYJ104	Carbon	100K ohms 1/16W
R24	ERJ3GEYJ222	Carbon	2.2K ohms 1/16W	R95	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R25	ERJ3GEYJ223	Carbon	22K ohms 1/16W	R96	ERJ3GEYJ680	Carbon	68 ohms 1/16W
R26	ERJ3GEYJ103	Carbon	10K ohms 1/16W	R97	ERJ3GEYJ470	Carbon	47 ohms 1/16W
R27	ERJ3GEYJ682	Carbon	6.8K ohms 1/16W	R98,99	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W
R28	ERJ3GEYJ392	Carbon	3.9K ohms 1/16W	R100	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R29	ERJ3GEYJ682	Carbon	6.8K ohms 1/16W	R101	ERJ3GEYJ153	Carbon	15K ohms 1/16W
R30	ERJ3GEYJ103	Carbon	10K ohms 1/16W	R102	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R31	ERJ3GEYJ153	Carbon	15K ohms 1/16W	R103	ERJ3GEYJ104	Carbon	100K ohms 1/16W
R32	ERJ3GEYJ822	Carbon	8.2K ohms 1/16W	R104	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W
R33	ERJ3GEYJ153	Carbon	15K ohms 1/16W	R105,106	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R34	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W	R108,109	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R35	ERJ3GEYJ822	Carbon	8.2K ohms 1/16W	R110	ERJ3GEYJ824	Carbon	820K ohms 1/16W
R36,37	ERJ3GEYJ512	Carbon	5.1K ohms 1/16W	R111	ERJ3GEYJ470	Carbon	47 ohms 1/16W
R38	ERJ3GEYJ302	Carbon	3K ohms 1/16W	R112	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W
R39,40	ERJ3GEYJ512	Carbon	5.1K ohms 1/16W	R113	ERJ3GEYJ472	Carbon	4.7K ohms 1/16W
R41	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W	R114	ERJ3GEYJ223	Carbon	22K ohms 1/16W
R42	ERJ3GEYJ392	Carbon	3.9K ohms 1/16W	R115	ERJ3GEYJ105	Carbon	1M ohms 1/16W
R43	ERJ3GEYJ102	Carbon	1K ohms 1/16W	R116	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R44,45	ERJ3GEYJ103	Carbon	10K ohms 1/16W	R117	ERJ3GEYJ182	Carbon	1.8K ohms 1/16W
R46	ERJ3GEYJ202	Carbon	2K ohms 1/16W	R118	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W
R47	ERJ3GEYJ562	Carbon	5.6K ohms 1/16W	R119	YWR1220P332D	Metal	3.3K ohms
R48	ERJ3GEYJ102	Carbon	1K ohms 1/16W	R120	ERJ3GEYJ123	Carbon	12K ohms 1/16W
R49	ERJ3GEYJ432	Carbon	4.3K ohms 1/16W	R121	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R50-52	ERJ3GEYJ103	Carbon	10K ohms 1/16W	R122	ERJ3GEYJ104	Carbon	100K ohms 1/16W
R53	YWR1220P273D	Metal	27K ohms	R123,124	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R54-56	ERJ3GEYJ103	Carbon	10K ohms 1/16W	R125	ERJ3GEYJ223	Carbon	22K ohms 1/16W
R57	ERJ3GEYJ473	Carbon	47K ohms 1/16W	R126	ERJ3GEYJ153	Carbon	15K ohms 1/16W
R58	ERJ3GEYJ104	Carbon	100K ohms 1/16W	R127	ERJ3GEYJ223	Carbon	22K ohms 1/16W
R59	ERJ3GEYJ473	Carbon	47K ohms 1/16W	R128	ERJ3GEYJ153	Carbon	15K ohms 1/16W
R60-62	ERJ3GEYJ223	Carbon	22K ohms 1/16W	R129	ERJ3GEYJ273	Carbon	27K ohms 1/16W
R63	ERJ3GEYJ473	Carbon	47K ohms 1/16W	R130	ERJ3GEYJ153	Carbon	15K ohms 1/16W
R64	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W	R131	ERJ3GEYJ272	Carbon	2.7K ohms 1/16W
R65	ERJ3GEYJ473	Carbon	47K ohms 1/16W	R132	ERJ3GEYJ182	Carbon	1.8K ohms 1/16W
R66	ERJ3GEYJ223	Carbon	22K ohms 1/16W	R133	ERJ3GEYJ561	Carbon	560 ohms 1/16W
R67	ERJ3GEYJ104	Carbon	100K ohms 1/16W	R134	ERJ3GEYJ122	Carbon	1.2K ohms 1/16W
R68,69	ERJ3GEYJ333	Carbon	33K ohms 1/16W	R135	ERJ3GEYJ223	Carbon	22K ohms 1/16W
R70	ERJ3GEYJ154	Carbon	150K ohms 1/16W	R136	ERJ3GEYJ122	Carbon	1.2K ohms 1/16W
R71	ERJ3GEYJ102	Carbon	1K ohms 1/16W	R137	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R72	ERJ3GEYJ101	Carbon	100 ohms 1/16W	R138	ERJ3GEYJ223	Carbon	22K ohms 1/16W
R73,74	ERJ3GEYJ473	Carbon	47K ohms 1/16W	R139	ERJ3GEYJ331	Carbon	330 ohms 1/16W
R75	ERJ3GEYJ472	Carbon	4.7K ohms 1/16W	R140	ERJ3GEYJ471	Carbon	470 ohms 1/16W

REF.NO.	PART NO.	DESCRIPTION	
R141	ERJ3GEYJ821	Carbon	820 ohms 1/16W
R142	ERJ3GEYJ182	Carbon	1.8K ohms 1/16W
R143	ERJ3GEYJ471	Carbon	470 ohms 1/16W
R144,145	ERJ3GEYJ332	Carbon	3.3K ohms 1/16W
R146	ERJ3GEYJ471	Carbon	470 ohms 1/16W
R147	ERJ3GEYJ390	Carbon	39 ohms 1/16W
R149	YWR1220Q470D	Metal	47 ohms
R151	ERJ3GEYJ753	Carbon	75K ohms 1/16W
R308	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R309	ERJ3GEYJ680	Carbon	68 ohms 1/16W
R310	ERJ3GEYJ470	Carbon	47 ohms 1/16W
R312	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R313	ERJ3GEYJ113	Carbon	11K ohms 1/16W
R401	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R402	ERJ3GEYJ562	Carbon	5.6K ohms 1/16W
R403	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R404	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R405	ERJ3GEYJ562	Carbon	5.6K ohms 1/16W
R406	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R407	ERJ3GEYJ100	Carbon	10 ohms 1/16W
VR1	EVM13SW00B13	Variable Resistor	1K ohms
VR2	EVM13SW00BQ2	Variable Resistor	470 ohms
VR5,6	EVM13SW00BC3	Variable Resistor	1.5K ohms
VR7,8	EVM13SW00B14	Variable Resistor	10K ohms
VR9	EVM13SW00B13	Variable Resistor	1K ohms
Z1	YFRKM10L104F	Block Resistor	
C1	ECEA0JK220	Electrolytic	22 µF 6.3V
C2,3	ECA1EFQ270	Electrolytic	27 µF 25V
C4	ECA1CFQ560	Electrolytic	56 µF 16V
C5,6	ECA1AFQ181	Electrolytic	180 µF 10V
C7	YW5X562K5VB	Ceramic	5600 pF
C8,9	ECA1EFQ270	Electrolytic	27 µF 25V
C10,11	YW5F103Z5VB	Ceramic	0.01 µF
C12	ECEA1EK3R3	Electrolytic	3.3 µF 25V
C13	EECF5R5U104	Electrolytic	0.1 µF
C14	YW5F103Z5VB	Ceramic	0.01 µF
C15	YF426103XMS	Ceramic	0.01 µF
C16	YW5X222K5VB	Ceramic	2200 pF
C17-19	ECA1CFQ121	Electrolytic	120 µF 16V
C20	YW5X222K5VB	Ceramic	2200 pF
C21	YW5X102K5VB	Ceramic	1000 pF
C22	YW5F103Z5VB	Ceramic	0.01 µF
C23,24	ECA0JFQ221	Electrolytic	220 µF 6.3V
C25,26	ECEA0JK220	Electrolytic	22 µF 6.3V
C27,28	ECEA1HKK010	Electrolytic	1 µF 50V
C29	ECEA0GKS470	Electrolytic	47 µF 4V
C30	ECSF1AE226	Tantalum	22 µF 10V
C31-33	YW5F104Z2VB	Ceramic	0.1 µF
C34,35	ECEA1HKKR33	Electrolytic	0.33 µF 50V (KS)
C36	ECEA1AKK100	Electrolytic	10 µF 6.3V
C37,38	ECEA1CKS100	Electrolytic	10 µF 10V
C39	ECSF1AE225	Tantalum	2.2 µF 10V
C40	YW5F104Z2VB	Ceramic	0.1 µF
C42,43	YW5CH240J5VB	Ceramic	24 pF 50V
C44	ECST1EY105	Tantalum	1 µF 25V

REF.NO.	PART NO.	DESCRIPTION	
C45	ECEA1AKS221	Electrolytic	220 µF 10V(KS)
C46	ECEA1AKA101	Electrolytic	100 µF 10V
C47	ECEA1HKK010	Electrolytic	1 µF 50V
C48	YW5CH240J5VB	Ceramic	24 pF 50V
C49	ECQV1H124JZ	Plastic	0.12 µF 50V
C51	ECST1EY105	Tantalum	1 µF 25V
C53	ECEA1HN010S	Electrolytic	1 µF 50V
C54	ECEA1AKS470	Electrolytic	47 µF 10V
C55	ECEA1HKK010	Electrolytic	1 µF 50V
C56	YW5F103Z5VB	Ceramic	0.01 µF
C57	ECEA0JKS470	Electrolytic	47 µF 6.3V
C58	ECQV1H124JZ	Plastic	0.12 µF 50V
C59	ECST1EY105	Tantalum	1 µF 25V
C60	ECEA1HN010S	Electrolytic	1 µF 50V
C61	ECEA0JK220	Electrolytic	22 µF 6.3V
C62	YF400224FZT	Ceramic	0.22 µF
C63	ECEA1EN4R7S	Electrolytic	4.7 µF 25V
C64	YW5F104Z2VB	Ceramic	0.1 µF
C65	ECSF1HE104	Tantalum	0.1 µF 50V
C66	ECEA1CKA220	Electrolytic	22 µF 16V
C67	ECEA1CKS100	Electrolytic	10 µF 10V
C68	YW5F104Z2VB	Ceramic	0.1 µF
C69,70	ECEA0JK220	Electrolytic	22 µF 6.3V
C71	ECEA1CKS100	Electrolytic	10 µF 10V
C72	ECEA0JK220	Electrolytic	22 µF 6.3V
C73	YW5F473Z2VB	Ceramic	0.047 µF
C74	ECEA1AKK100	Electrolytic	10 µF 6.3V
C75	YW5F103Z5VB	Ceramic	0.01 µF
C76	ECA1CFQ560	Electrolytic	56 µF 16V
C77	ECST1EY105	Tantalum	1 µF 25V
C78	YW5CH240J5VB	Ceramic	24 pF 50V
C250,251	YW5CH101J5VB	Ceramic	100 pF
C306	ECEA1AKS221	Electrolytic	220 µF 10V(KS)
C307	ECEA1AKA101	Electrolytic	100 µF 10V
L2	YFNL45T181K	Coil	180 µH
L4	YWNL45121K	Coil	120 µH
L5	YWF3225C181	Coil	180 µH
L6-8	ELESE220KA	Coil	22 µH
L9	ELC08C003	Coil	
L10-13	YWF3216C150K	Coil	15 µH
L151,152	YWF3216AR82	Coil	0.82 µH
T1	ELL10R024	Flyback Transformer	
SW1	YWSKHHPL001	Push Switch	
SW2	YWSSS21200	Slide Switch	
SW3	YWSKHHPL001	Push Switch	
X1	YFEF0-FC4004	Crystal Oscillator	
CF50,51	YW2943666671	Filter	
CF150	YWBLM31A02PT	Filter	
CN2	YWY05S15T2EF	Connector	
J80,81	ERJ3GEY0R00	Jumper Resistor	
J89,90	ERJ3GEY0R00	Jumper Resistor	
J150,305	ERJ3GEY0R00	Jumper Resistor	
J306,307	ERJ3GEY0R00	Jumper Resistor	
JK1	YWSJ09431040	Jack	
CN1	YWY03S15T2EF	3-pin Connector	

REF.NO.	PART NO.	DESCRIPTION
CN3	S2PS2T2EF	2-pin Connector
M20	YWV1KA0121A4	Washer
M21	YWV2HA0898A4	Shield Cover A
M22	YWV2HA0899A4	Shield Cover B
M23	YWV2HA0908A4	Shield Cover C
M24	YWV2PA0408A4	Insulator

PROCESS BOARD

REF.NO.	PART NO.	DESCRIPTION
PCB2 (NLA)	YWVKCGAF5E2A	Printed Circuit Board Assy
IC1	MN3107CS	IC
IC4	AN2011S	IC
IC5	MN3820S	IC
IC8	AN2154FAP	LSI
IC9	AN2254FAP	LSI
IC301	MN53015XBR	IC
IC302	MN5117	IC
IC303	MN676021PDS	IC
IC304	MN53003LVV	IC
C305,307	YWTC7S08F	IC
Q1,2	2SD1819-QRS	Transistor
Q3,4	2SA1462	Transistor
Q5,6	2SC3735	Transistor
Q7	2SA1462	Transistor
Q8	2SC3735	Transistor
Q10,11	2SD1819-QRS	Transistor
Q12	2SC3931-CD	Transistor
Q13-15	2SB1218-QRS	Transistor
Q16	2SD1819-QRS	Transistor
Q17	2SB1218-QRS	Transistor
Q18	2SD1819-QRS	Transistor
Q19,20	2SB1218-QRS	Transistor
Q21,22	2SD1819-QRS	Transistor
Q23	2SB1218-QRS	Transistor
Q28,29	2SD1819-QRS	Transistor
Q30	2SB1218-QRS	Transistor
Q31	UN2214	Transistor
Q32	2SB1218-QRS	Transistor
Q33	XN1501	Transistor
Q34	XN1401	Transistor
Q301-303	2SK662-PQR	FET
Q304,305	2SD1819-QRS	Transistor
D1	MA141K	Diode
D2-7	MA729	Diode
D11	MA141K	Diode
D12	YWMA1120M	Diode
D14,15	MA141K	Diode
D301	MA141K	Diode
D302-304	1SV153	Diode
D308	1SV153	Diode

REF.NO.	PART NO.	DESCRIPTION
R1	ERJ3GEYJ333	Carbon 33K ohms 1/16W
R2	ERJ3GEYJ912	Carbon 9.1K ohms 1/16W
R3	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R4	ERJ3GEYJ183	Carbon 18K ohms 1/16W
R5	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R6	ERJ3GEYJ333	Carbon 33K ohms 1/16W
R34	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R35-37	ERJ3GEYJ390	Carbon 39 ohms 1/16W
R60	ERJ3GEYJ102	Carbon 1K ohms 1/16W
R61	ERJ3GEYJ222	Carbon 2.2K ohms 1/16W
R62	ERJ3GEYJ152	Carbon 1.5K ohms 1/16W
R65-67	ERJ3GEYJ102	Carbon 1K ohms 1/16W
R68	ERJ3GEYJ561	Carbon 560 ohms 1/16W
R69	ERJ3GEYJ621	Carbon 620 ohms 1/16W
R70,71	ERJ3GEYJ562	Carbon 5.6K ohms 1/16W
R72	ERJ3GEYJ392	Carbon 3.9K ohms 1/16W
R73	ERJ3GEYJ472	Carbon 4.7K ohms 1/16W
R74	ERJ3GEYJ222	Carbon 2.2K ohms 1/16W
R75	ERJ3GEYJ562	Carbon 5.6K ohms 1/16W
R76	ERJ3GEYJ471	Carbon 470 ohms 1/16W
R77	ERJ3GEYJ182	Carbon 1.8K ohms 1/16W
R78,79	ERJ3GEYJ472	Carbon 4.7K ohms 1/16W
R80	ERJ3GEYJ102	Carbon 1K ohms 1/16W
R81,82	ERJ3GEYJ682	Carbon 6.8K ohms 1/16W
R83	ERJ3GEYJ153	Carbon 15K ohms 1/16W
R84	ERJ3GEYJ222	Carbon 2.2K ohms 1/16W
R85	ERJ3GEYJ680	Carbon 68 ohms 1/16W
R86	ERJ3GEYJ333	Carbon 33K ohms 1/16W
R87	ERJ3GEYJ152	Carbon 1.5K ohms 1/16W
R88	ERJ3GEYJ620	Carbon 62 ohms 1/16W
R89	ERJ3GEYJ100	Carbon 10 ohms 1/16W
R90	ERJ3GEYJ222	Carbon 2.2K ohms 1/16W
R91	ERJ3GEYJ392	Carbon 3.9K ohms 1/16W
R92	ERJ3GEYJ151	Carbon 150 ohms 1/16W
R93,98	ERJ3GEYJ182	Carbon 1.8K ohms 1/16W
R99	ERJ3GEYJ391	Carbon 390 ohms 1/16W
R100	ERJ3GEYJ123	Carbon 12K ohms 1/16W
R101	ERJ3GEYJ332	Carbon 3.3K ohms 1/16W
R102	ERJ3GEYJ153	Carbon 15K ohms 1/16W
R103	ERJ3GEYJ473	Carbon 47K ohms 1/16W
R104,105	ERJ3GEYJ153	Carbon 15K ohms 1/16W
R106,107	ERJ3GEYJ333	Carbon 33K ohms 1/16W
R108	ERJ3GEYJ133	Carbon 13K ohms 1/16W
R109	ERJ3GEYJ183	Carbon 18K ohms 1/16W
R110	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R111	ERJ3GEYJ821	Carbon 820 ohms 1/16W
R113	ERJ3GEYJ104	Carbon 100K ohms 1/16W
R114	ERJ3GEYJ102	Carbon 1K ohms 1/16W
R115	ERJ3GEYJ183	Carbon 18K ohms 1/16W
R116	ERJ3GEYJ393	Carbon 39K ohms 1/16W
R117	ERJ3GEYJ473	Carbon 47K ohms 1/16W
R118	ERJ3GEYJ562	Carbon 5.6K ohms 1/16W
R120	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R121	ERJ3GEYJ472	Carbon 4.7K ohms 1/16W
R122-124	ERJ3GEYJ102	Carbon 1K ohms 1/16W

REF.NO.	PART NO.	DESCRIPTION	
R125-127	ERJ3GEYJ333	Carbon	33K ohms 1/16W
R128	ERJ3GEYJ222	Carbon	2.2K ohms 1/16W
R129	ERJ3GEYJ472	Carbon	4.7K ohms 1/16W
R130	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R131,132	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R133	ERJ3GEYJ472	Carbon	4.7K ohms 1/16W
R134	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R135	ERJ3GEYJ472	Carbon	4.7K ohms 1/16W
R136	ERJ3GEYJ622	Carbon	6.2K ohms 1/16W
R137	ERJ3GEYJ681	Carbon	680 ohms 1/16W
R139	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R140	ERJ3GEYJ681	Carbon	680 ohms 1/16W
R141	ERJ3GEYJ562	Carbon	5.6K ohms 1/16W
R142	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R143	ERJ3GEYJ392	Carbon	3.9K ohms 1/16W
R144	ERJ3GEYJ223	Carbon	22K ohms 1/16W
R145,146	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R147	ERJ3GEYJ391	Carbon	390 ohms 1/16W
R148,149	ERJ3GEYJ153	Carbon	15K ohms 1/16W
R150	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R151	ERJ3GEYJ223	Carbon	22K ohms 1/16W
R152	ERJ3GEYJ472	Carbon	4.7K ohms 1/16W
R153	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R154	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R155	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R156	ERJ3GEYJ222	Carbon	2.2K ohms 1/16W
R159	ERJ3GEYJ681	Carbon	680 ohms 1/16W
R160	ERJ3GEYJ331	Carbon	330 ohms 1/16W
R161	ERJ3GEYJ222	Carbon	2.2K ohms 1/16W
R162	ERJ3GEYJ471	Carbon	470 ohms 1/16W
R300	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R301	ERJ3GEYJ331	Carbon	330 ohms 1/16W
R302,303	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R304	ERJ3GEYJ122	Carbon	1.2K ohms 1/16W
R305	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R307,308	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R309	ERJ3GEYJ105	Carbon	1M ohms 1/16W
R310	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R311,312	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R313,314	ERJ3GEYJ392	Carbon	3.9K ohms 1/16W
R319	ERJ3GEYJ682	Carbon	6.8K ohms 1/16W
R320	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R322,323	ERJ3GEYJ272	Carbon	2.7K ohms 1/16W
R324	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R325	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R326	ERJ3GEYJ202	Carbon	2K ohms 1/16W
R327	ERJ3GEYJ302	Carbon	3K ohms 1/16W
R328,329	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R332	ERJ3GEYJ101	Carbon	100 ohms 1/16W
R335	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R340	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R342	ERJ3GEYJ302	Carbon	3K ohms 1/16W
R343,344	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R348,349	ERJ3GEYJ122	Carbon	1.2K ohms 1/16W
R350,351	ERJ3GEYJ682	Carbon	6.8K ohms 1/16W

REF.NO.	PART NO.	DESCRIPTION	
R354	ERJ3GEYJ561	Carbon	560 ohms 1/16W
R355	ERJ3GEYJ562	Carbon	5.6K ohms 1/16W
R356,357	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R358,359	ERJ3GEYJ392	Carbon	3.9K ohms 1/16W
R360	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R365,366	ERJ3GEYJ222	Carbon	2.2K ohms 1/16W
R369	ERJ3GEYJ302	Carbon	3K ohms 1/16W
R370	ERJ3GEYJ103	Carbon	10K ohms 1/16W
R372	ERJ3GEYJ222	Carbon	2.2K ohms 1/16W
R373	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R374	ERJ3GEYJ122	Carbon	1.2K ohms 1/16W
R377	ERJ3GEYJ511	Carbon	510 ohms 1/16W
R378	ERJ3GEYJ681	Carbon	680 ohms 1/16W
R379	ERJ3GEYJ511	Carbon	510 ohms 1/16W
R380	ERJ3GEYJ102	Carbon	1K ohms 1/16W
R381	ERJ3GEYJ683	Carbon	68K ohms 1/16W
R382	ERJ3GEYJ303	Carbon	30K ohms 1/16W
R400	ERJ3GEYJ101	Carbon	100 ohms 1/16W
VR2	EVM13SW00B23	Variable Resistor	2K ohms
VR3	EVM13SW00B53	Variable Resistor	5K ohms
VR4	EVM7PGA00B24	Variable Resistor	20K ohms
VR5	EVM13SW00B14	Variable Resistor	10K ohms
VR6	EVM7PGA00B54	Variable Resistor	50K ohms
VR7,8	EVM7PGA00B24	Variable Resistor	20K ohms
VR9	EVM13SW00B23	Variable Resistor	2K ohms
VR10,11	EVM13SW00B13	Variable Resistor	1K ohms
VR12,13	EVM13SW00B24	Variable Resistor	20K ohms
VR14,15	EVM13SW00B14	Variable Resistor	10K ohms
VR16	EVM13SW00B53	Variable Resistor	5K ohms
VR301	EVM13SW00B14	Variable Resistor	10K ohms
C1-3	ECEA1CKS100	Electrolytic	10 µF 16V
C4	YW5F104Z2VB	Ceramic	0.1 µF
C14,15	ECEA1CKS100	Electrolytic	10 µF 16V
C16	ECST1AB106	Electrolytic	10 µF 10V
C17	YW5CH560J5VB	Ceramic	56 pF
C18	YW5CH101J5VB	Ceramic	100 pF
C19-22	YW5CH560J5VB	Ceramic	56 pF
C23	YW5CH151J5VB	Ceramic	150 pF
C24	YW5CH470J5VB	Ceramic	47 pF
C25	YW5CH560J5VB	Ceramic	56 pF
C41	ECST1CC106ZR	Tantalum	10 µF 16V
C42	YW5CH120J5VB	Ceramic	12 pF
C43	YW5CH180J5VB	Ceramic	18 pF
C44	YW5CH100J5VB	Ceramic	10 pF
C45	ECEA1AS470	Electrolytic	47 µF 10V
C46	YW5CH180J5VB	Ceramic	18 pF
C47,48	ECST1AB106	Tantalum	10 µF 10V
C49	YW5X561K5VB	Ceramic	560 pF
C50	YW5CH680J5VB	Ceramic	68 pF
C52	ECEA1HKK010	Electrolytic	1 µF 50V
C53	YW5X102K5VB	Ceramic	1000 pF
C54	YW5F103Z5VB	Ceramic	0.01 µF
C56	YW5CH750J5VB	Ceramic	75 pF
C57	YW5F104Z2VB	Ceramic	0.1 µF
C58	YW5CH330J5VB	Ceramic	33 pF

REF.NO.	PART NO.	DESCRIPTION	
C59	ECEA0JKS330	Electrolytic	33 μF 6.3V
C60	ECEA1HKK2R2	Electrolytic	2.2 μF 25V
C61	ECST1AB106	Tantalum	10 μF 10V
C62	ECEA1CKS100	Electrolytic	10 μF 10V
C63	ECEA1HN010S	Electrolytic	1 μF 50V
C64	ECEA1CKS100	Electrolytic	10 μF 16V
C65	ECEA0JKS330	Electrolytic	33 μF 6.3V
C66,67	YW5F103Z5VB	Ceramic	0.01 μF
C69	YW5CH560J5VB	Ceramic	56 pF
C70	YW5F103Z5VB	Ceramic	0.01 μF
C71-77	YW5F104Z2VB	Ceramic	0.1 μF
C78	YW5F103Z5VB	Ceramic	0.01 μF
C79	YW5F473Z2VB	Ceramic	0.047 μF
C80	YW5F104Z2VB	Ceramic	0.1 μF
C81	YW5F473Z2VB	Ceramic	0.047 μF
C82	YW5F104Z2VB	Ceramic	0.1 μF
C83	ECSF1AE226	Tantalum	22 μF 10V
C84	ECEA1HKK2R2	Electrolytic	2.2 μF 25V
C85	YW5F103Z5VB	Ceramic	0.01 μF
C86	ECEA1AKK100	Electrolytic	10 μF 6.3V
C87,88	YW400473XK	Ceramic	0.047 μF
C89	ECST1AC226	Tantalum	22 μF 10V
C90	YW400473XK	Ceramic	0.047 μF
C91	ECEA0JKS330	Electrolytic	33 μF 6.3V
C92	YW400473XK	Ceramic	0.047 μF
C93	YW5F104Z2VB	Ceramic	0.1 μF
C94	YW400473XK	Ceramic	0.047 μF
C95	YW5F104Z2VB	Ceramic	0.1 μF
C96	YW5F473Z2VB	Ceramic	0.047 μF
C97,98	YW5F104Z2VB	Ceramic	0.1 μF
C99	YW5F473Z2VB	Ceramic	0.047 μF
C100	YW5CH101J5VB	Ceramic	100 pF
C101	ECEA1CKS100	Electrolytic	10 μF 16V
C102	ECEA0JS470	Electrolytic	47 μF 6.3V
C103	YW5F154Z2VB	Ceramic	0.15 μF
C104	YW5X223K2VB	Ceramic	0.022 μF
C105,106	YW5F103Z5VB	Ceramic	0.01 μF
C107	YW5CH270J5VB	Ceramic	27 pF
C108-111	YW5F104Z2VB	Ceramic	0.1 μF
C113	ECST1AD336ZR	Tantalum	33 μF 10V
C114	ECEA1HKK2R2	Electrolytic	2.2 μF 25V
C115	ECST1AC226	Tantalum	22 μF 10V
C116,117	ECEA0JKA221	Electrolytic	220 μF 6.3V
C302	YW5CH150J5VB	Ceramic	15 pF
C303	YW5CH080J5VB	Ceramic	8 pF
C304,305	YW5CH150J5VB	Ceramic	15 pF
C306	YW5CH331J5VB	Ceramic	330 pF
C307	YW5F104Z2VB	Ceramic	0.1 μF
C308	YW5CH331J5VB	Ceramic	330 pF
C309	YW5CH390J5VB	Ceramic	39 pF
C310	YW5CH100J5VB	Ceramic	10 pF
C311	ECST1AB106	Tantalum	10 μF 10V
C312	YW5CH331J5VB	Ceramic	330 pF
C314	ECST1AC226	Tantalum	22 μF 10V
C315	YW5F103Z5VB	Ceramic	0.01 μF

REF.NO.	PART NO.	DESCRIPTION	
C316	ECEA1HKK2R2	Electrolytic	2.2 μF 25V
C317	ECST1AC226	Tantalum	22 μF 10V
C318	ECST1AB106	Tantalum	10 μF 10V
C319	YW5F103Z5VB	Ceramic	0.01 μF
C320	YW5CH220J5VB	Ceramic	22 pF
C321	YW5CH331J5VB	Ceramic	330 pF
C322	YW5CH030D5VB	Ceramic	3 pF
C323	YW5F103Z5VB	Ceramic	0.01 μF
C324	ECEA1AKK100	Electrolytic	10 μF 6.3V
C325	ECST1AB106	Tantalum	10 μF 10V
C326,327	YW5CH220J5VB	Ceramic	22 pF
C328	ECST1AB106	Tantalum	10 μF 10V
C329	YW5CH470J5VB	Ceramic	47 pF
C330	YW5CH331J5VB	Ceramic	330 pF
C332	YW5F104Z2VB	Ceramic	0.1 μF
C333	YW5CH080J5VB	Ceramic	8 pF
C334	YW5X102K5VB	Ceramic	1000 pF
C336	YW5CH470J5VB	Ceramic	47 pF
C338	ECEA1CKA100	Electrolytic	10 μF 16V
C339	ECEA1AU221	Electrolytic	220 μF 10V
C400,401	YW5X102K5VB	Ceramic	1000 pF
C402-404	YW5F104Z2VB	Ceramic	0.1 μF
C405	YW5CH101J5VB	Ceramic	100 pF
CT2	ECRJA006A11	Trimmer Capacitor	
L1	YWF3216C150K	Coil	15 μH
L2,4	YWNL32150K	Coil	15 μH
L5,7	YWNL32150K	Coil	15 μH
L8	YWF3216C150K	Coil	15 μH
L9,10	YWNL32330K	Coil	33 μH
L11-13	YWNL32150K	Coil	15 μH
L301	YWEIC5EB004A	Coil	
L302-304	YWNL32150K	Coil	15 μH
L305,306	YWNL328R2K	Coil	8.2 μH
X301	YFMS30917M10	Crystal Oscillator	
X302	YWN8R4R40625	Crystal Oscillator	
CF4,5	YWSS306B101T	Filter	
CF6	ELB5B034	Filter	
CF7	ELB4E030	Filter	
CF8	YWELB4A017	Filter	
CF9	ELB5B014	Filter	
CF10	YWELB4E018	Filter	
CF11	ELB4D010	Filter	
CF12	YWELB4B001	Filter	
CF13,14	ELB4B076	Filter	
CF307	YWBLM31A02PT	Filter	
CN1	YWY08S15T2EF	8-pin Connector	
CN2	YWY12S15T2EF	12-pin Connector	
CN3	YW520302610	26-pin Connector	
CN5	YWY02S15T2EF	2-pin Connector	
J316	ERJ3GEY0R00	Jumper Resistor	
J318	ERJ3GEY0R00	Jumper Resistor	
J330	ERJ3GEY0R00	Jumper Resistor	
J334	ERJ3GEY0R00	Jumper Resistor	
J337	ERJ3GEY0R00	Jumper Resistor	

REF.NO.	PART NO.	DESCRIPTION
J339	ERJ3GEY0R00	Jumper Resistor
J345	ERJ3GEY0R00	Jumper Resistor
J352	ERJ3GEY0R00	Jumper Resistor
J401,402	ERJ3GEY0R00	Jumper Resistor
M20	YWV1KA0121A4	Earth Lug Washer
M26	YWV2HA0900A4	Shield Parts
M27	YWV2HA0901A4	Shield Parts
M28	YWV2HA0903A4	Shield Parts
M29	YWV2HA0904A4	Shield Parts

CONNECTOR BOARD

REF.NO.	PART NO.	DESCRIPTION
PCB3 (NLA)	YWVKDGAF5E2A	Printed Circuit Board Assy
C1	ECKF1H122KB	Ceramic 1200 pF 50V
CF1-5	YWBLM31A02PT	Filter
CN1	YW17A13RASD	12-pin Connector

SENSOR BOARD

REF.NO.	PART NO.	DESCRIPTION
PCB4 (NLA)	YWVKYGAF5E1A	Printed Circuit Board Assy
R1-3	ERJ3GEYJ101	Carbon 100 ohms 1/16W
C1,2	YW5F473Z2VB	Ceramic 0.047 µF
CN1	YW31756436	6-pin Connector
CN2	YW41756430	10-pin Connector

MIC BOARD

REF.NO.	PART NO.	DESCRIPTION
PCB5 (NLA)	YWVKBGAF5E1A	Printed Circuit Board Assy
IC2	NJM4558M	IC
Q1	2SC3929-RS	Transistor
D6	MA143	Diode
R1	ERJ3GEYJ122	Carbon 1.2K ohms 1/16W
R2	ERJ3GEYJ392	Carbon 3.9K ohms 1/16W
R3	ERJ3GEYJ822	Carbon 8.2K ohms 1/16W
R4	ERJ3GEYJ104	Carbon 100K ohms 1/16W
R5	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R6,7	ERJ3GEYJ104	Carbon 100K ohms 1/16W
R8	ERJ3GEYJ332	Carbon 3.3K ohms 1/16W
R9	ERJ3GEYJ102	Carbon 1K ohms 1/16W
R10,11	ERJ3GEYJ104	Carbon 100K ohms 1/16W
R12	ERJ3GEYJ204	Carbon 200K ohms 1/16W
R13	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R14	ERJ3GEYJ680	Carbon 68 ohms 1/16W
C3	ECST1CC106ZR	Electrolytic 10 µF 16V
C4	YW5CH101J5VB	Ceramic 100 pF
C5,6	YW5F104Z2VB	Ceramic 0.1 µF
C7	YW5F153Z5VB	Ceramic 0.015 µF
C8	YW5X472K2VB	Ceramic 4700pF

REF.NO.	PART NO.	DESCRIPTION
C9	YW5CH820J5VB	Ceramic 82 pF
C10	YW5F104Z2VB	Ceramic 0.1 µF
C11	ECST1CC106ZR	Tantalum 10 µF 16V
CN1	YW530480410	4-pin Connector
CN2	YW530480210	2-pin Connector
J20	ERJ3GEY0R00	Jumper Resistor

ALC BOARD

REF.NO.	PART NO.	DESCRIPTION
PCB6 (NLA)	YWVKCGAF5E1A	Printed Circuit Board Assy
IC3	NJM3414M	IC
IC4	AN1358S	IC
Q2	2SC3931-CD	Transistor
R14	ERJ3GEYJ101	Carbon 100 ohms 1/16W
R15	ERJ3GEYJ470	Carbon 47 ohms 1/16W
R16	ERJ3GEYJ152	Carbon 1.5K ohms 1/16W
R17	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R18	ERJ3GEYJ102	Carbon 1K ohms 1/16W
R19	ERJ3GEYJ222	Carbon 2.2K ohms 1/16W
R20	ERJ3GEYJ473	Carbon 47K ohms 1/16W
R21	ERJ3GEYJ392	Carbon 3.9K ohms 1/16W
R22	ERJ3GEYJ104	Carbon 100K ohms 1/16W
R23	ERJ3GEYJ203	Carbon 20K ohms 1/16W
R24	ERJ3GEYJ473	Carbon 47K ohms 1/16W
R25	ERJ3GEYJ752	Carbon 7.5K ohms 1/16W
R26	ERJ3GEYJ153	Carbon 15K ohms 1/16W
R27	ERJ3GEYJ271	Carbon 270 ohms 1/16W
R28	ERJ3GEYJ333	Carbon 33K ohms 1/16W
R29	ERJ3GEYJ203	Carbon 20K ohms 1/16W
R39	ERJ3GEYJ103	Carbon 10K ohms 1/16W
R40	ERJ3GEYJ563	Carbon 56K ohms 1/16W
R50	ERJ3GEYJ202	Carbon 2K ohms 1/16W
VR1	EVM13SW00B14	Variable Resistor 10K ohms
C11,12	ECST1VD475	Tantalum 4.7 µF 35V
C13	YW5F473Z2VB	Ceramic 0.047 µF
C14	ECST1CB475ZR	Tantalum 4.7 µF 16V
C15	ECEV1CV100	Electrolytic 10 µF 16V
C16	YW5F103Z5VB	Ceramic 0.01 µF
C18	YW5F154Z2VB	Ceramic 0.15 µF
C19	ECEV1EV4R7	Electrolytic 4.7 µF 25V
C20,34	YW5F104Z2VB	Ceramic 0.1 µF
C35	YW5X202K2VB	Ceramic 2000 pF
L1	YWNL32150K	Coil 15 µH
CN1	YW31746406	6-pin Connector
CN2	JMI6LH07ACT	7-pin Connector

DRIVE BOARD

REF.NO.	PART NO.	DESCRIPTION
PCB7 (NLA)	YWVKDGAF5E1A	Printed Circuit Board Assy
IC5	AN78L06M	IC
Q10	2SD601-RS	Transistor
Q11	2SB709-QRS	Transistor
D1,2	MA141K	Diode
D5	MA153	Diode
R1	ERJ3GEYJ105	Carbon 1M ohms 1/16W
R2-4	ERJ3GEYJ272	Carbon 2.7K ohms 1/16W
R5	ERJ3GEYJ152	Carbon 1.5K ohms 1/16W
R6	ERJ3GEYJ331	Carbon 330 ohms 1/16W
R7	ERJ3GEYJ511	Carbon 510 ohms 1/16W
R31	ERJ3GEYJ153	Carbon 15K ohms 1/16W
R32	ERJ3GEYJ104	Carbon 100K ohms 1/16W
R33	ERJ3GEYJ330	Carbon 33 ohms 1/16W
R35	ERJ3GEYJ273	Carbon 27K ohms 1/16W
R38	ERJ3GEYJ680	Carbon 68 ohms 1/16W
VR2	EVM13SW00B25	Variable Resistor 200K ohms
C21	ECEA1HK010	Electrolytic 1 µF 50V
C22	YW5X682K2VB	Ceramic 6800 pF
C23	ECEV1CV100	Electrolytic 10 µF 16V
C24	ECST1CB475ZR	Tantalum 4.7 µF 16V
C25	YW5F104Z2VB	Ceramic 0.1 µF
C32	ECEV1CV470	Electrolytic 47 µF 16V
C33	YW5F104Z2VB	Ceramic 0.1 µF
C40	ECST1AD336ZR	Tantalum 33 µF 10V
CN1	YW41746400	10-pin Connector
CN2	JMI6LH06ACT	6-pin Connector

ACCESSORY PARTS/PACKAGING PARTS

REF.NO.	PART NO.	DESCRIPTION
E110	YWF05018	Camera Connector Cable
M60	YWV8QA2219AN	Operating Instructions
M61	YWT10X35C03	Polyethylene Bag
M62	YWT20X25C03	Polyethylene Bag
M63	YWT050803	Polyethylene Bag
M64	YWT10X16C03	Polyethylene Bag
M65	YWV9CA1501AN	Packaging Assy
M66	YWS-SNPRB06	Packaging Label
M67	YWV7SA1203A3	Packaging Label